TI 6130.6

HARDWARE DESIGN DATA (HDD)

INSTRUCTION BOOK

FLIGHT DATA INPUT/OUTPUT (FDIO) SYSTEM

PERSONAL COMPUTER REMOTE CONTROL UNIT (PC-RCU) EMULATION

VOLUME 3

SECTION 12

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Operational Support
National En Route Automation Division, AOS-300
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REVISION HISTORY

Level/Revision	Date	CCD/PTR Number	Comments
01	July 1994	N15532	Remote Control Unit PC Replacement. See Order 6130.1, Chapter 242.
02	May 1998	N18093 N18341	Remote Control Unit PC Replacement. See Order 6130.1, Chapter 242.
03	June 1999	N20716 N20442	Initial release by the FAA. Refer to Order 6130.1, Chapter 253.
04	March 2000	N21168	Refer to Order 6130.1, Chapter 255.
05	June 2000	N21971	Refer to Order 6130.1, Chapter 254.
06	May 2002	N22914 N23047	Refer to SSM–FDIO–001.
07	November 2002	N23645 N23463	Refer to SSM–FDIO–002.
08	December 2002	N23871	Installation of FDIO PC–RCU Version 1.7. Refer to SSM–FDIO–003.

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

LIST OF ILLUSTRATIONS

LIST OF TABLES

12.0 PERSONAL COMPUTER-REMOTE CONTROL UNIT (PC-RCU) REPLACEMENT

12.1 INTRODUCTION

This section provides guidance to personnel who install, operate, and maintain the PC based RCU that is an emulation of the Flight Data Input/Output (FDIO) RCU located at the Air Traffic Control Towers (ATCT). This section covers general system information, equipment requirements, operation, operating principals, and periodic preventive and corrective maintenance procedures. The manual also includes parts information, installation and integration and checkout information. Areas covered are limited to the PC system and areas that differ from the current RCU configuration. For information regarding the FDIO peripherals refer to the appropriate sections of this manual.

12.1.1 Equipment Description

The PC-RCU system will allow the ATCT remote sites to interface via modems with a Central Control Unit (CCU) at the Air Route Traffic Control Center (ARTCC) which is connected to the National Airspace System (NAS) Host Computer System (HCS) via a Peripheral Adapter Module Replacement Item (PAMRI) and a General Purpose Input (GPI) General Purpose Output (GPO) pair.

The PC-RCU system consists of the following elements:

PC-RCU   A control element which receives signals from the modem connected to the CCU at the ARTCC. The PC-RCU routes these signals to the Replacement Flight Strip Printer (RFSP), Replacement Alphanumeric Keyboard (RANK), and Cathode Ray Tube (CRT) elements through serial channels. The PC-RCU consists of the following:

    a. Two PCs with Video Graphics Array (VGA) Color display and keyboard.

    b. Two or four Peripheral Interface boards with eight RS-422 asynchronous serial ports.

    c. Two Qua Tech, Inc. MPA-100 RS-232 synchronous communication boards.

    d. Black Box Automatic Switching System consisting of the following:

        1. Automatic Rack Chassis,

        2. Power Supply Card, and

        3. A/B DB9 cards (one for each peripheral plus one for the modem).

    e. Two 3.5-inch High Density floppy disks. Refer to section 12.9.3.1 for a description of the floppy disks.

    f. Two APC SurgeArrest Rackmount surge protection devices.

12.1.2   Applicable Documents

This paragraph lists reference and supporting documents pertinent to the PC-RCU System.

a.   NCR System 3000 Model 3230, User's Manual

b.   HOT-433,486 PCI/ISA Mainboard User's Manual

c.   Qua Tech, Inc. MPA-100 Board, Hardware Reference Guide

d.   Star Gate Technologies, Inc. PLUS-8 Board, Instruction Manual

e.   Digi International, Inc. ClassicBoard 8 Installation Guide

f.   Black Box Automatic Switching System, Installation and Operation Manual

g.   APC SurgeArrest Rackmount Surge Protection Manual

12.1.3   Relationship of Units

Typical makeup of a remote group will include two PC-RCU systems switchable through a Black Box Automatic Switching System. The typical peripheral configuration will consist of a minimum of one RFSP peripheral element, one RANK peripheral element, and one CRT peripheral element with a maximum of sixteen total peripherals.

12.1.3.1   Cabinet Assembly Configuration.   The PC-RCU can be configured in two cabinet assembly configurations:

1.   Standard 21-inch rack configuration or

2.   Wespercorp 19-inch rack configuration.

12.1.3.1.1   Standard 21-Inch Rack Configuration.   This rack configuration pertains to sites that do not have the Wespercorp 19-inch rack available. Refer to figure 12-1 for shelf placement and layout of equipment within cabinet.

12.1.3.1.2   Wespercorp 19-Inch Rack Configuration.   This rack configuration pertains to sites that previously had the Wespercorp RCU configuration and are replacing it with the PC-RCU system. Refer to figure 12-2 for shelf placement and layout of equipment within cabinet.

12.1.4   Equipment Specification Data

Equipment specification data including functional characteristics, external power requirements, rated output, and environmental characteristics are outlined in table 12-1.

12.1.5   Equipment and Accessories Supplied

Control unit configurations supplied for the FDIO system are listed in table 12-2.
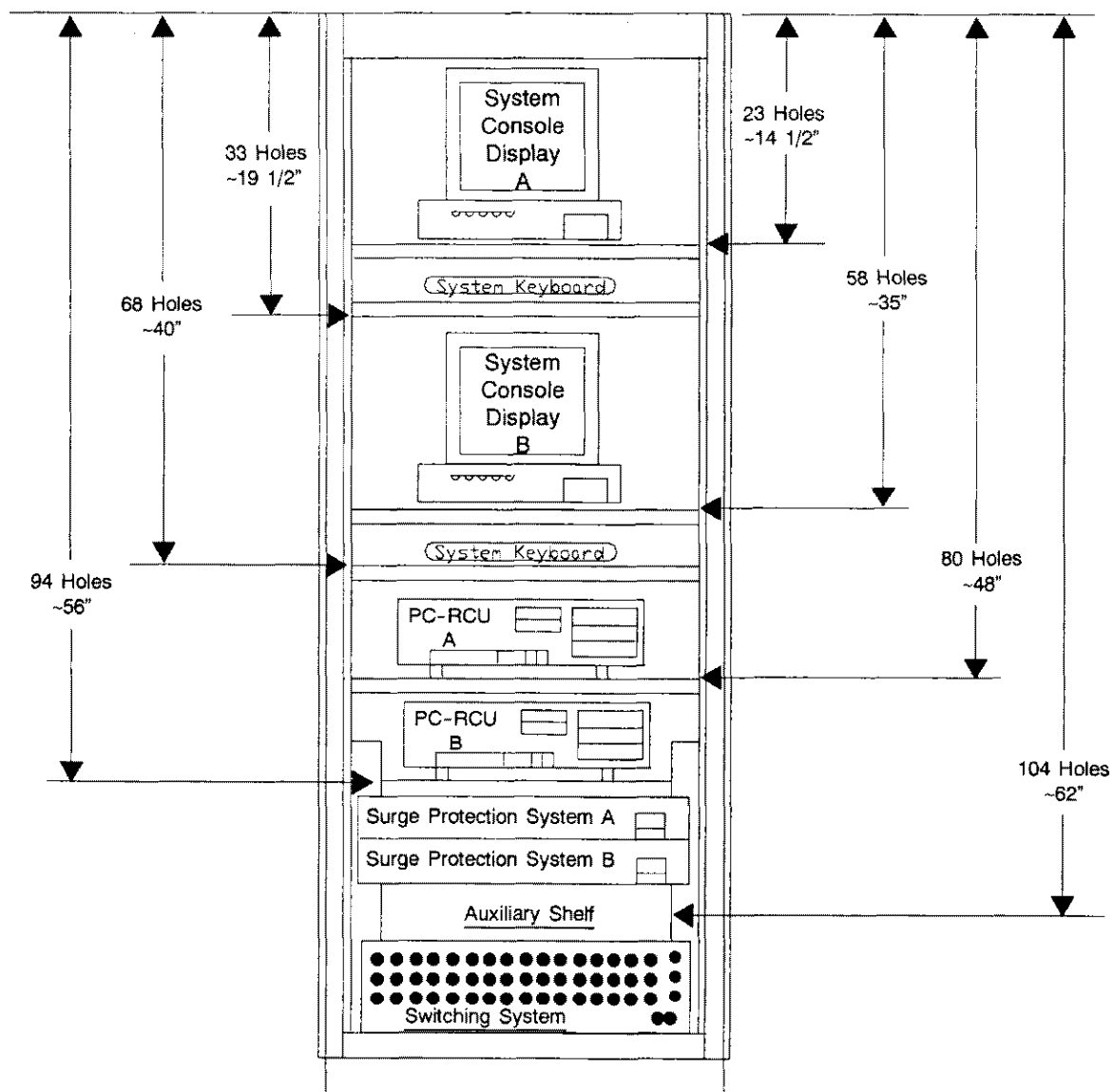
FIGURE 12-1.   STANDARD 21-INCH RACK CONFIGURATION
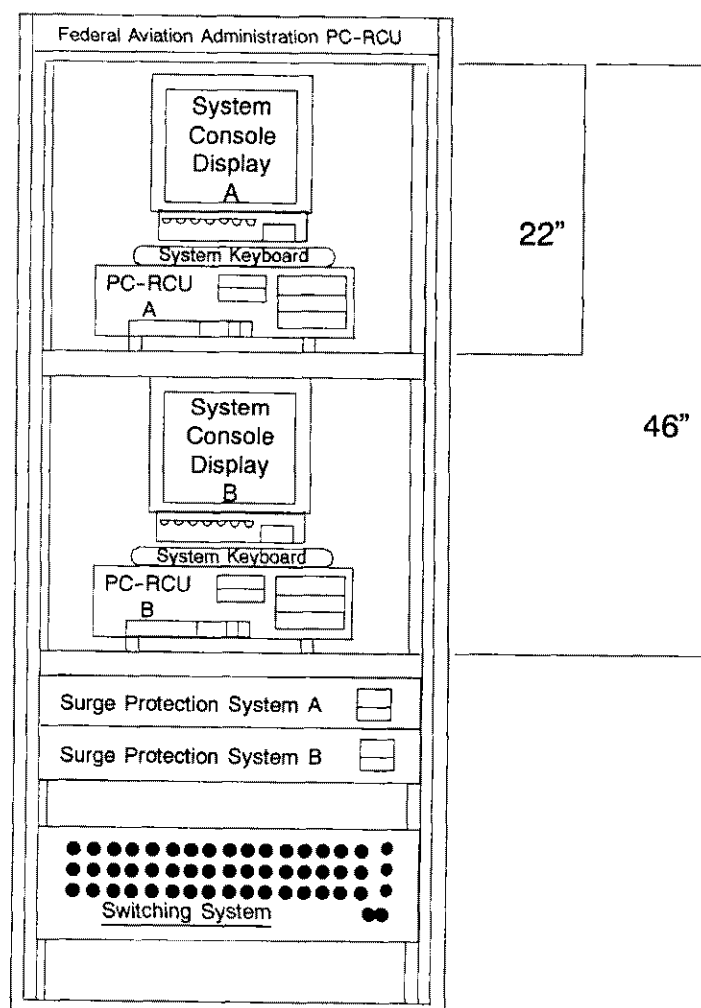
FIGURE 12-2.   WESPERCORP 19-INCH RACK CONFIGURATION

TABLE 12-1. EQUIPMENT SPECIFICATION DATA

Power Requirements

Nominal Voltage 115 volts (V)
Input voltage: 100 to 125 V alternating current (ac)
Input current: maximum 4.0 amperes (A)
Frequency: 60 hertz (Hz)

Environmental Characteristics

Ambient Temperature	59° to 90° Fahrenheit
Relative Humidity	20% to 80% noncondensing

TABLE 12-2. EQUIPMENT SUPPLIED (AMERICAN MEASUREMENT)

Nomenclature	FAA Number	Dimensions in inches (each)	Weight in pounds (each)	Volume in cubic feet (each)
PC-RCU Central Processing Unit (CPU)	FA 10095/13 uncrated:	h — 4.1 w — 16.3 d — 16.1	24	0.623
System Console Display	uncrated:	h — 13.9 w — 13.8 d — 15.7	32	1.743
System Interface Keyboard	uncrated:	h — 1.8 w — 18.5 d — 7.5	3	0.144
PC-RCU (CPU)	FA 10095/16 uncrated:	h — 5.8 w — 15.5 d — 16.0	22	0.832
System Console Display	uncrated:	h — 13.0 w — 13.9 d — 14.6	28.6	1.527
System Interface Keyboard	uncrated:	h — 1.5 w — 17.8 d — 6.5	2.5	0.100

12.2   THEORY OF OPERATION

12.2.1   Introduction

This section briefly describes the individual components that make up the PC–RCU system.

12.2.2   Hardware Description

The PC–RCU system is composed of distinct modules as shown in the block diagram in figure 12–3.

12.2.3   Control Unit

The control unit is a PC utilizing an Intel 486 SX microprocessor. The PC will provide the hardware interface between the modem and the peripherals via the RS–422 asynchronous serial ports contained on the peripheral interface board. The PC–RCU software will be loaded from disk and will initialize the system and its peripherals for operation. The monitor and the keyboard of the PC will allow the user (operator/technician) to interface with the PC–RCU system.

12.2.4   Peripheral Interface Boards

The peripheral interface boards are asynchronous serial communication boards manufactured by Star Gate Technologies, Inc. and Digi International, Inc. that plug into an empty full size slot on the mother board of the computer. This board provides eight RS–422 serial ports that are compatible with the serial interface as used on the FDIO peripherals. The PC–RCU can be configured with 1 or 2 peripheral interface boards allowing for up to 16 peripheral connections. The RS–422 interface provides a balanced line for transmit (TX) data and receive (RX) data and allows cable lengths up to 4000-feet. The FDIO peripherals use a software handshake protocol, which only requires that TX and RX signal lines be used. The data rate between the peripheral interface board and the remote devices is 2400-baud.

12.2.4.1   PLUS–8 Adapter Board.   The input/output (I/O) addresses of the PLUS–8 board are determined by a Program Array Logic (PAL) chip on the board and an associated dip switch. I/O addresses for the Star Gate PLUS–8 board are as follows:

A–Board		B–Board (2 board cfg)	
Port A1	280H	Port B1	180H
Port A2	288H	Port B2	188H
Port A3	290H	Port B3	190H
Port A4	298H	Port B4	198H
Port A5	2A0H	Port B5	1A0H
Port A6	2A8H	Port B6	1A8H
Port A7	2B0H	Port B7	1B0H
Port A8	2B8H	Port B8	1B8H

Refer to paragraph 12.9.3.3.1 for the dip switch settings to enable these I/O addresses.
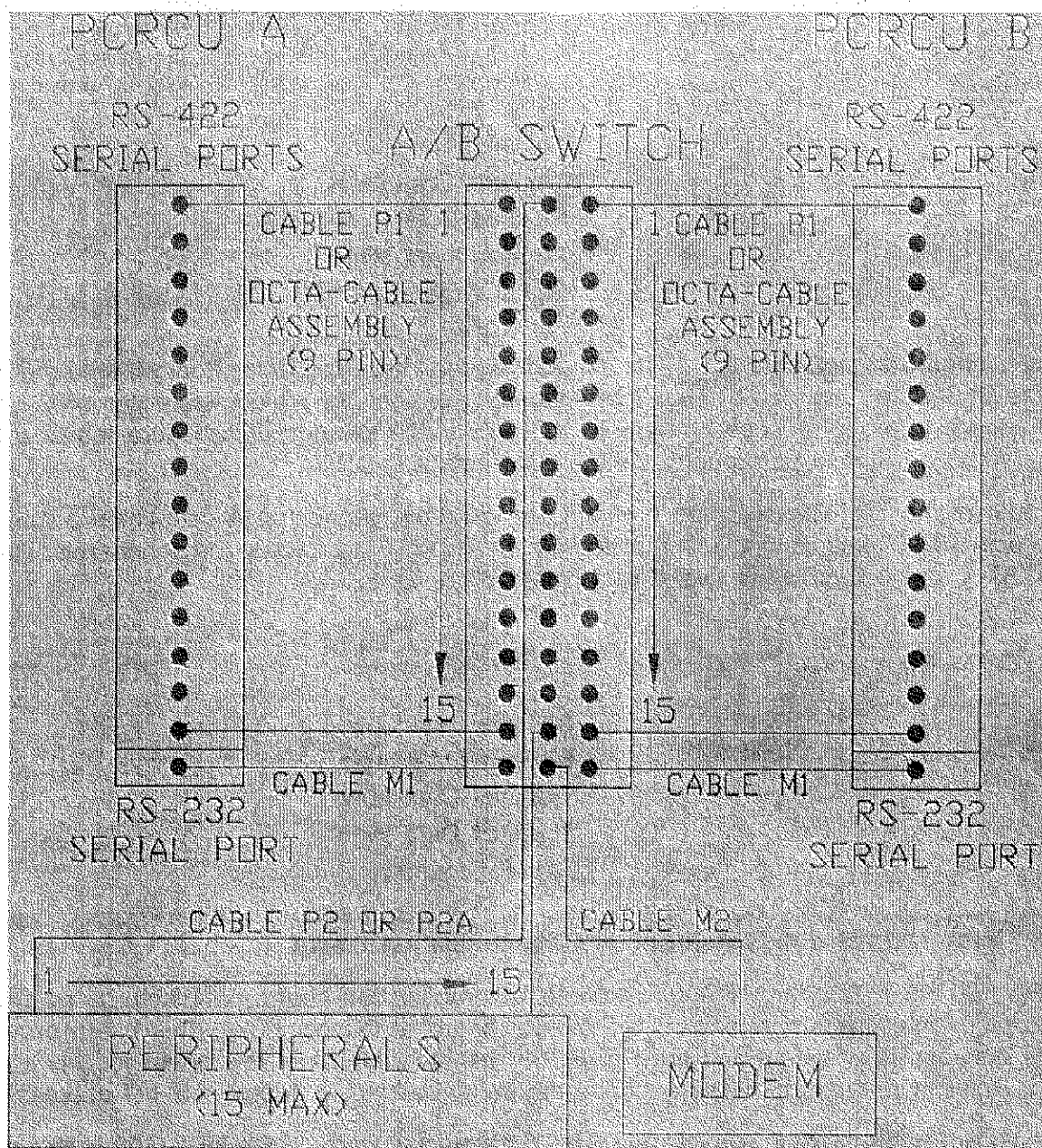
FIGURE 12-3.   PC-RCU SYSTEM

The output of the Star Gate PLUS-8 board is through a single DB-25 connector, which contains the signal lines for all eight ports. The output at this point travels through a shielded ribbon cable and conforms to RS-232 signal level. At the I/O interface panel the signals are converted to RS-422 levels and distributed to eight DB-9 connectors on the panel. The pin out for the DB-9 I/O ports connectors on the Star Gate Peripheral Interface remote panel are as follows:

Pin	Function
7	Transmit Data Low
4	Transmit Data High
2	Receive Data Low
9	Receive Data High
5	Signal Ground

12.2.4.2   Digi ClassicBoard 8.   The I/O addresses of the Digi ClassicBoard 8 are programmable using the **CFG** Utility provided by Digit International. The board is pre-configured as an A-board and should adhere to these settings by default. To verify these settings or configure the board for the B-board settings, refer to paragraph 12.9.3.3.2 for instructions.

The output of the Digi ClassicBoard 8 is through a 78-pin connector. A octa-cable assembly fans out into eight DB-9 male connections that provide the RS-422 interface to the peripherals. The pin-out for the DB-9 connectors of the Digi ClassicBoard 8 are as follows:

Pin	Function
9	Receive Data Low
8	Receive Data High
7	Transmit Data Low
6	Transmit Data High
5	Signal Ground

12.2.5   MPA-100 RS-232 Synchronous Communication Board

The MPA-100 RS-232 board is a synchronous communication board manufactured by Qua Tech, Inc. and plugs into any empty slot on the mother board of the computer. This board provides the interface between the modem and the PC-RCU. The I/O address of this board for this application is 270H. Refer to paragraph 12.9.3.4 for the dip switch setting to enable this I/O address.

The connection to the modem is through a DB-25 connector. Refer to the MPA-100 Board Hardware Reference Guide for a pin out of the DB-25 connector.

Messages are transmitted over the modem link between the CCU and PC-RCU modem interface. These messages are received bit serially using Advanced Data Communications Control Procedures (ADCCP) protocol. The modem serial interface of the MPA-100 board receives the message and stores it in Random Access Memory (RAM). After the entire message is received and buffered, it is decoded and processed. Text messages in the PC-RCU are processed and are distributed to the RFSP and CRT peripheral devices. Messages that are not text messages cause internal operations to be performed.

12.2.6   Black **Box** Switching System

The Black Box Switching System provides ganged switching capability of all peripherals and modem connections between operational and standby PC-RCU systems via one ganged switch.

The system provides switching capability for the modem connection and up to 15 peripherals and up to 15 peripheral connections. Each connection is run through a 9-pin interface card. The system also contains a power supply card and a control card. In the event of a power failure, the system remains in the last switched position.

12.2.7   APC **SurgeArrest** Rackmount System

The APC SurgeArrest Rackmount System provides protection for the PC-RCU and its system components from damage by a surge or lightning strike.

12.2.8   Peripheral Data Lines Lightning Surge Protection

The PC-RCU peripheral data lines lightning surge protection is provided by using type 66 telephone punch down block with metal side plates to hold DB-9 jacks. Male jacks are mounted on one side of the block and female jacks are on the other side. This block is mounted on a steel-mounting bracket for ease in attaching to the PC-RCU cabinet. A ground bus bar connects all surge protection modules together. A #6 ground wire is connected between the ground bus bar and the system ground plate. LINX UP1-16 surge protection modules are plugged into the punch down block. Each surge protection module can protect two lines. The FDIO peripheral cable uses four data lines and one ground line. Therefore, two and one-half surge modules protect one peripheral cable. Reference Figure 12-3A, PC-RCU Surge Protection Layout, or Figure 12-38, Tower Cab Protection Layout, for lightning surge block layout.

The vertical run (peripheral cable from the PC-RCU to tower peripherals) is the most susceptible to lightning transiets. Therefore, the vertical run is protected at both ends (PC-RCU and tower cab).

At the PC-RCU end the peripheral cable is removed from the A/B switch and connected to the lightning protection block. A short cable is connected from the protection block to the A/B switch. Reference figure 12-3A. In the tower cab the peripheral cables are cut and DB-9 male and female plugs are added. These plugs are connected to the protection block. Reference figure 12-38.

The lightning protection block is wired to provide continuity from the male jack to punch block to female jack. Continuity is provided whether or not the surge protection module is installed. If the line voltage exceeds 16 V, the surge protection module will provide **a** path to ground. This will shunt the voltage until it drops below 16 V. At that time it will open and normal path is restored.

The male and female jacks are provided **so** that the peripheral cables can be removed and be butted together to completely isolate the lightning protection function for aid in isolating peripheral failures.

FIGURE 12-3A. PC-RCU SURGE PROTECTION LAYOUT

Peripheral cable will be plugged into the center jack (common) on the A/B switch Box

Each peripheral has 5 lines.

Jacks A & A1 are a pair.

Each Module protects 2 lines.

Module 1, 2 & half of 3 protect A & A1 peripheral.

Module 4, 5 & the other half of 3 protect B & B1, etc.

The shared module (3) is the ground for pairs A & A1 and B & B1.

Pair	Module	Ground Module
A & A1	1 & 2	3
B & B1	4 & 5	3
C & C1	6 & 7	8
D & D1	9 & 10	8
E & E1	11 & 12	13
F & F1	14 & 15	13
G & G1	16 & 17	18
H & H1	19 & 20	18

NOTE: Surge Protection Module's are plugged into Column 3.

FIGURE 12-36. TOWER CAB SURGE PROTECTION LAYOUT

Each peripheral has **5** lines.

Jacks A & A1 are a pair.

Each Module protects 2 **lines.**

Module 1, 2 & half of 3 protect A & A1 peripheral.

Module **4,5** & the other half of 3 protect B & B1, etc.

The shared module (3) is the ground for pairs A & A1 and B & B1.

NOTE: Surge Protection Module's are plugged into Column 3.

Pair	Module	Ground Module
A & A1	1 & 2	3
B & B1	4 & 5	3
C & C1	6 & 7	8
D & D1	9 & 10	8
E & E1	11 & 12	13
F & F1	14 & 15	13
G & G1	16 & 17	18
H & H1	19 & 20	18

12.3   OPERATION

This section provides information and instructions for operating the PC–RCU system.

12.3.1   Operational Modes

Several elements of the PC-RCU system can operate in more than one mode. The PC-RCU operates in main mode under normal conditions, which means that the equipment has been configured and is online. Main mode enables error messages to be displayed on the system console monitor. In addition to main mode, the PC-RCU has a Diagnostic (DIAG) mode to test the system for operation, and a Reconfiguration (RECN) mode to assign peripherals to ports on the peripheral interface panel, and to assign pairing, backup, error logger devices and full- or half-strip setting.

12.3.2   System Console Controls and Indicators

The following paragraphs describe the controls and indicators of the PC–RCU system console. The system console consists of the PC, monitor, and keyboard.

12.3.2.1   PC Controls and Indicators.   Refer to vendor's PC User's Manual for location of PC controls and indicators.

12.3.2.2   Monitor Controls and Indicators.   The system console monitor is an 80-column by 25-line color monitor which has an area to display error messages on the right two-thirds of the screen and a layout of the functions available on the left third of the screen. See figure 12–4 for a layout of the main mode screen. Refer to vendor's PC User's Manual for the location of the monitor controls and indicators.

12.3.2.3   System Console Keyboard.   The system console keyboard is a standard 101-key keyboard with 12 function keys that allow the operator or technician to communicate with the control element. Table 12–3 illustrates the controls and indicators of the system console keyboard.

12.3.3   Turn On and Checkout

12.3.3.1   PC-RCU Power Switch.   Refer to the vendor's PC User's Manual for the location of the power switch.

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┌──────────────────────────────────────────────────────────────┐
│                                                                │
│    FDIO PC-RCU          Version x.x       DOMESTIC/OCEANIC CFG  │
│  ┌──────────────────────┐  ┌──────────────────────────────────┐│
│  │     MAIN MENU        │  │ ERROR LOG:       [ F10 = Message  ││
│  │                      │  │                        ACK]       ││
│  │  ┌──┐                │  │                                   ││
│  │  │F2│  Reconfiguration│  │                                   ││
│  │  └──┘                │  │                                   ││
│  │  ┌──┐                │  │                                   ││
│  │  │F4│  Diagnostics    │  │                                   ││
│  │  └──┘                │  │                                   ││
│  │  ┌──┐                │  │                                   ││
│  │  │F6│  Error History  │  │                                   ││
│  │  └──┘                │  │                                   ││
│  │                      │  │                                   ││
│  └──────────────────────┘  └──────────────────────────────────┘│
│                                          PRIMARY/SECONDARY      │
└──────────────────────────────────────────────────────────────┘
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FIGURE 12-4.   SYSTEM MONITOR MAIN MENU

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TABLE 12-3.   SYSTEM CONSOLE KEYBOARD CONTROLS AND INDICATORS

Control or Indicator	Function
Numerics (0-9)	Input to DIAG, RECN, and SEL display prompts.
Yes (Y)	Allows positive response to system prompts.
Reconfiguration (F2)	Allows access to reconfiguration of rank pairing, error logger, CRT pairing, and TAB settings.
No (N)	Allows negative response to system prompts.
DIAG (F4)	Allows access to DIAG task.
ESC	To leave operator initiated task (SEL, DIAG or RECN) and return to normal operation.
MSG-ACK (F10)	To clear error messages shown on front panel.
BACKSPACE	During RECN, SEL and DIAG, this key clears numeric data entered by the operator prior to pressing enter.
ENTER	During RECN, SEL and DIAG, this key enters numeric data on display into memory. The next prompt in the sequence is then displayed.
Error History (F6)	Allows access to system error log.

12.3.3.2   PC-RCU System Power Up.   The procedures for system power up assume that all peripherals are connected and powered ON and PC-RCU software is installed as per instructions in paragraph 12.9.3.2. Power ON the system monitor. Power ON the PC-RCU. At power up, the system will perform initialization DIAGs (procedure requires approximately 30 seconds). If the configuration files are not found on disk, they will be built during system initialization. If they already exist on disk, and provided that the actual configuration as determined by the power up DIAGs matches the configuration stored on disk, and no other errors are determined, the system is now operational. Peripherals will be initialized and operational. If the PC-RCU configuration, as viewed through the RECONFIGURATION MENU, does not equal the actual configuration, follow procedures in section 12.3.4.5 to properly configure the system.

12.3.3.3   System Console Checkout.   The system console software is made up of a group of commands. It is through this software that the user communicates with the PC-RCU system.

The system console keyboard enables the user to interface with the DIAG and RECN tasks, to check device status, and to acknowledge system errors. DIAG operations and system status are discussed in paragraph 12.7.1.2. RECN procedures are discussed in paragraph 12.3.4.5. Under normal conditions, the system console requires no operator intervention.

12.3.3.4   RFSP Turn On and Checkout.   Refer to section 3.3.6 for RFSP Turn on and Checkout information. Refer to paragraph 12.3.4.5.4 for RFSP pairing instructions.

12.3.3.5   RANK Turn On and Checkout.   Refer to section 3.3.7 for RANK Turn on and Checkout information . Refer to paragraph 12.3.4.5.2 for RANK pairing instructions.

12.3.3.6   CRT Turn On and Checkout.   Refer to section 3.3.8 for CRT Turn on and Checkout information. Refer to paragraph 12.3.4.5.4 for CRT to printer pairing.

12.3.4   System Console Operations

12.3.4.1   PC-RCU System Alarm.   A momentary alarm generated by the PC will sound if a system or device error occurs or if the RFSP peripheral needs operator attention. Any condition causing the alarm to sound will result in the error being written to the system error logger and to disk. The error will also be displayed on the system monitor. The procedures for selecting the error logger device are described in paragraph 12.3.4.5.3.

12.3.4.2   PC-RCU System Console Monitor.   The system console monitor will display error messages. When the screen is at full capacity, the error messages will scroll. The most recent error will be displayed on the last line of the screen and the oldest message will scroll off the top of the screen. To acknowledge the errors on the screen press the Function key F10, this will clear all the error messages from the screen. Refer to paragraph 12.7.6.2 for the procedure to clear the System Error Logger (SEL).

12.3.4.3   PC-RCU System Console Keyboard.   The system console keyboard enables the user to interface with the DIAG and RECN tasks, to check device status, and to acknowledge system errors. DIAG operations and system status are discussed in section 12.7. RECN procedures are discussed in paragraph 12.3.4.5. Under normal conditions, the system console requires no operator intervention.

The system console keyboard is a standard 101-key keyboard with 12 function keys that allow the operator or technician to communicate with the control element. The following keys will remain constant in all modes of operation of the PC-RCU system:

    a.   Function F10 — Acknowledge (ACK) up to 17 error messages displayed in the error message display area.

    b.   ESC: Exit — Will return to main mode.

    c.   ENTER — During RECN, SEL, and DIAG, this key enters numeric data on display into memory. The next prompt in the sequence is then displayed.

The system console keyboard allows the user to clear error messages and to perform RECN and DIAG tasks. See figure 12-4 for a layout of the system monitor MAIN MENU.

12.3.4.4   Error Conditions.   A non-fatal error (e.g., RFSP out of paper) does not impair the processing capabilities of the control unit or interfere with the communication link between the NAS HCS and the primary processing unit. A non-fatal error is treated as a temporary problem to be corrected internally.

Error messages received reflect the specific error, severity of condition and will be displayed on the system console monitor. See paragraph 12.7.1.1.2 for additional information on error messages displayed through the system console monitor.

12.3.4.5   RECN Procedure.   The RECN task of the PC-RCU assigns peripheral devices and dependent systems to the I/O port connection on the peripheral interface board. The RECN task also is used to pair peripheral devices, to assign backups, to configure RFSPs for half/full strips, and to assign an error logger device. The procedures are found in paragraphs 12.3.4.5.1 through 12.3.4.5.6.

12.3.4.5.1   Port Assignment Procedures.   The port assignment procedures allow for configuration of FDIO peripheral devices and dependent systems to ports on the peripheral interface card.

12.3.4.5.1.1   Peripheral Assignment Procedures

<u>Steps</u>

1   The user will check the system console monitor menu display area to determine the system mode. If the system is not in main mode, press the ESC key to enter the MAIN MENU (see figure 12-4).

2   Press Function key F2 to enter the RECONFIGURATION MENU (see figure 12-5).

3   Press Function key F1 to initiate a Port assignment. The system will respond with the following prompt in the Menu display area:

>   Type of Device
>   being configured?
>
>   F2   Peripheral
>   F4   Echo Port

4   Press Function key F2 to assign an FDIO peripheral (RFSP, CRT, or RANK) to a port on the peripheral interface card. Refer to section 12.3.4.5.1.2 to configure a dependent system as an echo device.

5   The system will respond with the following prompt in the Menu display area:

>   Which device?

6   Enter the device number, 1 — 10 (RFSPs), 11 — 15 (CRTs), and 16 — 20 (RANKs). Press ENTER. The system will respond with one of the following messages:

>   Device (dev #) assigned to (port #)

>   if the requested device is already assigned to a port or,

>   Device (dev #) not assigned

>   if the requested device is not presently assigned.

<div align="center">

NOTE

(dev #) = device number
(port #) = port number

</div>

7   The system will then prompt the user for the port number to assign the device to:

>   Which Port?
>   (A1-A8,
>   B1-B8, or
>   -- for none)

FDIO PC–RCU   Version x.x   DOMESTIC CFG

RECN: CURRENT CONFIGURATION:

| ESC | Main Menu |

RFSPs   CRTs

| F1 | Port assignment |

| F3 | RANK pairing |

| F5 | Error logger |

| F7 | RFSP pairing |

| F8 | Formfeed Timeout |

| F9 | RFSP strip |

| F10 | Set Date and Time |

Dev Port CRT Size Echo Port (s)   Dev   Port

Dev	Port	CRT	Size	Echo	Port (s)
1	—	—	—	—	—	—
2	—	—	—	—	—	—
3	—	—	—	—	—	—
4	—	—	—	—	—	—
5	—	—	—	—	—	—
6	—	—	—	—	—	—
7	—	—	—	—	—	—
8	—	—	—	—	—	—
9	—	—	—	—	—	—
10	—	—	—	—	—	—

Dev	Port
11	—
12	—
13	—
14	—
15	—

RANKs & paired dev

Dev	Port	PR	BU
16	—	—	—
17	—	—	—
18	—	—	—
19	—	—	—
20	—	—	—

| Maint ch |

* = Successfully printed before echoed

Dev Port
21   —

| Error logger dev: |

PRIMARY/SECONDARY

FIGURE 12–5.   RECONFIGURATION MENU (DOMESTIC)

```
┌─────────────────────────────────────────────────────────────┐
│  FDIO PC-RCU          Version x.x          OCEANIC CFG        │
├──────────────────┬──────────────────────────────────────────┤
│  RECN:           │         CURRENT CONFIGURATION:            │
│                  │                                           │
│ ESC  Main Menu   │         RFSPs                    CRTs     │
│                  │  Dev Port   Echo Port (s)       Dev  Port │
│ F1   Port        │   1   —     — — —                11   —   │
│      assignment  │   2   —     — — —                12   —   │
│                  │   3   —     — — —                13   —   │
│ F3   RANK pairing│   4   —     — — —                14   —   │
│                  │   5   —     — — —                15   —   │
│ F5   Error logger│   6   —     — — —    RANKs & paired dev   │
│                  │   7   —     — — —    Dev Port PR  BU       │
│ F8   Formfeed    │   8   —     — — —                          │
│      Timeout     │   9   —     — — —     16  —  —  —          │
│                  │  10   —     — — —     17  —  —  —          │
│ F10  Set Date    │                      18  —  —  —          │
│      and Time    │  Maint ch  * = Successfully  19 — — —     │
│                  │            printed before   20 — — —      │
│                  │            echoed                         │
│                  │  Dev Port              Error logger dev:  │
│                  │  21  —                                    │
├──────────────────┴──────────────────────────────────────────┤
│                                      PRIMARY/SECONDARY       │
└─────────────────────────────────────────────────────────────┘
```

FIGURE 12-5A.   RECONFIGURATION MENU (OCEANIC)

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Steps (Cont.)

NOTE

The PC-RCU can be configured with one or two peripheral interface boards.
A1-A8 refer to ports 1 through 8 on the A-board and B1-B8 refer to ports
1 through 8 on the B-board.

8   Enter the port to which the device is physically attached and press ENTER. The system
will respond with the following:

> Connect to port (port #)
>
> Is this correct?
> Y or N

If a response of Y or Yes is entered, then the system will assign the specified device
to the specified port and will respond with the following:

> Connect to port (port #)
> Press ESC to save
> changes to disk or
>
> Press any key
> to continue

If a response of N or No is entered, then the system will return to the prompt in step
3 of paragraph 12.3.4.5.1.1.

9   To configure another device, press any key and the system will prompt for another
device.

10   The ESC key will save the configuration to disk and return to the MAIN MENU.

12.3.4.5.1.2   Echo Port Assignment Procedures

Steps

1   The user will check the system console monitor menu display area to determine the
system mode. If the system is not in main mode, press the ESC key to enter the MAIN
MENU (see figure 12-4).

2   Press Function key F2 to enter the RECONFIGURATION MENU (see figure 12-5 for
domestic configuration or figure 12-5A for oceanic configuration). ∎

3   Press Function key F1 to initiate a Port assignment. The system will respond with the
following prompt in the Menu display area:

> Type of Device
> being configured?
>
> F2   Peripheral
> F4   Echo Port

4   Press Function key F4 to assign an echo device to a dependent system and pair it
to an RFSP.

Steps **(Cont.)**

5   The system will respond with the following prompt in the Menu display area:

           Which Device?

6   Enter the device number of the RFSP for which data is to be echoed. The system will list any currently configured echo ports and prompt for a new connection or disconnection of an existing echo device:

           Device (dev #)
           Echoed to port(s)
           (port #) (port #) (port #)

           Connect or
           Disconnect?
           F1   Connect
           F3   Disconnect

7   Enter Function key F1 to connect a new echo device or F3 to disconnect an existing echo device. If disconnecting, the system will prompt for the port to be disconnected. Enter the port number to be disconnected and answer Yes to verify that it is correct. If connecting a new echo device the system will respond with the following:

           Echo Device (dev #)
           to port?
           (A1-A8, or
           B1-B8)

8   Enter the port to which the dependent device is physically attached. The system will respond with the following:

           Is this correct?
           Y or N

9   If a Yes response is entered, the system will respond with the following prompt:

           Ensure msg was
           printed before
           echoing?
           Y or N

10   Answering yes to this prompt configures the echo port to wait until the message was successfully printed on the paired printer before the copy of the message is sent to the echo device. A response of no to this prompt configures the echo port to immediately send the data to the echo device regardless if it gets printed on the primary printer. After responding to this prompt, hit any key to add another echo device to the same RFSP or press ESC to return to the MAIN MENU and save the configuration change to disk.

12.3.4.5.2   **RANK Pairing Procedures**

Steps

1   Refer to steps 1 and 2 of the port assignment procedures (paragraph 12.3.4.5.1).

Steps (Cont.)

2   Press the Function key F3 for RANK pairing. The system will respond with the following prompt in the Menu display area:

          Which RANK?
          (Dev 16 – 20)

3   Enter the device number of the RANK that is being paired. Press ENTER and the system will respond with the following prompt:

          Primary echo device
          or 0 for none.

4   Enter the device number of the unit that will be the echo device of RANK entered in step 3 of paragraph 12.3.4.5.2: 1 – 10 (RFSPs) or 11 –15 (CRTs). The system will respond with the following:

          Device (dev #)
          Primary echo dev (dev #)

          Backup echo dev
          or 0 for none

5   Enter the device number of the unit that will be the backup device for the primary device in step 4 of paragraph 12.3.4.5.2: 1 – 10 (RFSPs) or 11 – 15 (CRTs). The system will respond with the following:

          Device (dev #)
          Primary echo dev (dev #)

          Backup echo dev (dev #)

          Is this correct?
          Y or N

6   A response of Yes will assign the devices specified. The user will then be prompted for another pairing. A response of No will cancel the last pairing entries and prompt the user for another pairing. To return to the MAIN MENU and save the configuration to memory and to disk, press the ESC key.

12.3.4.5.3   Error Logger Assignment Procedures

Steps

1   Refer to steps 1 and 2 of the port assignment procedures (paragraph 12.3.4.5.1).

2   Press the Function key F5 from the RECONFIGURATION MENU for Error Logger assignment. At this point the user has four options:

     a.   Function key F9 — return to the RECONFIGURATION MENU.

     b.   Function key F2 — assign a RFSP as an Error Logger device. The system will prompt the user for a device number.

     c.   Function key F4 — disconnect an assigned Error Logger device.

     d.   ESC key — always returns to the MAIN MENU.

12.3.4.5.4 RFSP Pairing Procedures (Domestic only)

Steps

1   Refer to steps 1 and 2 of the port assignment procedures (paragraph 12.3.4.5.1).

2   Press the Function key F7 from the RECONFIGURATION MENU for RFSP pairing. The system will respond with the following prompt in the menu display area:

      Which RFSP?
      (dev 1 – 10)

3   Enter device number of the RFSP to be paired. The system will respond with the following:

      RFSP (dev #)

      Which CRT? (11 –15 or
      0 for none)

4   Enter the CRT device number which will be echoing the RFSP entered in step 3 of paragraph 12.3.4.5.4. The system will respond with the following:

      RFSP (dev #)
      Pair to CRT (dev #)
      Is this correct?
      Y or N

5   A response of Yes to this prompt will configure the pairing as entered. A response of No will return to the prompt in step 2 of paragraph 12.3.4.5.4.

6   To return to the RECONFIGURATION MENU press Function key F9. Pressing the ESC key will write the new configuration to disk and return to the MAIN MENU.

12.3.4.5.5 Setting Formfeed Timeout Parameter

The formfeed timeout parameter is the time period (in seconds) that the dot matrix printers wait before form feeding the flight strip paper so that the previously printed flight strip will be positioned at the tear bar. The acceptable range for this value is 0 to 9999 seconds. A value of 0 will disable this function.

Steps

1   Refer to steps 1 and 2 of the port assignment procedures (paragraph 12.3.4.5.1).

2   Press the Function key F8 from the RECONFIGURATION MENU to set/change the formfeed timeout parameter. The system will respond with the following prompt in the menu display area:

      Current formfeed
      timeout parameter
      is XXXX

      Enter new value
      In seconds
      (0-9999)

Steps (Cont.)

3   Enter the formfeed timeout parameter in seconds (0-9999). The system will respond
         with the following:

         Change to XXXX

         Is this correct?
         Y or N

4   A response of Yes to this prompt will configure the formfeed timeout parameter as entered.
         A response of No will return to the prompt in step 2.

5   To return to the RECONFIGURATION MENU press Function key F9. Pressing the ESC
         key will write the new value to disk and return to the MAIN MENU.

12.3.4.5.6   RFSP Half Strip/Full Strip Setting Procedures (Domestic only)

Steps

1   Refer to steps 1 and 2 of the port assignment procedures (paragraph 12.3.4.5.1).

2   Press the Function key F9 from the RECONFIGURATION MENU for RFSP strip configura-
         tion. The system will respond with the following prompt in the menu display area:

         Which RFSP?
         (dev 1 - 10)

3   Enter the RFSP device number of the printer to be configured. The system will respond
         with the following:

         RFSP (dev #)
         Strip size?
         F2 full
         F4
         half

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Steps **(Cont.)**

4   Set the strip configuration by pressing Function key F2 for full strips or Function key F4 for half strip setting. The system will respond with the following:

> RFSP (dev #)
> Strip size:(half or full)
> Press ESC to
> save changes to disk or
>
> Press any key
> to continue

5   Pressing Function key F9 will return to the RECONFIGURATION MENU. Pressing the ESC key will return the system to the MAIN MENU and will write the configuration to disk.

12.3.4.5.7   Set Date and Time Procedures   ▋

Steps

1   Refer to steps 1 and 2 of the port assignment procedures (paragraph 12.3.4.5.1).

2   Press the Function key F10 from the RECONFIGURATION MENU to set or change the system date and/or time. The system will respond with the current date and time in the DATE and TIME window and the following prompt in the menu display area:

> Date or Time?
>
> | F2 | Date
>
> | F4 | Time

3   Press the Function key F2 to change the date or F4 to change the time. A template for the appropriate format will be displayed in the menu display area.

4   Press ENTER. If the date or time entered is valid the new date or time will be displayed in the DATE and TIME window and the menu in step 2 or paragraph 12.3.4.5.6 will be redisplayed.

5   If no other changes are required enter the ESC key to return to the main menu or the F9 key to return to the RECONFIGURATION MENU.

12.3.4.6   DIAG Procedures.   DIAG procedures for the PC-RCU system are available through the DIAGNOSTIC MENU of the system console. The DIAG task allows the user to select and run the following two tests:

1.   Canned message — allows the user to send a canned message to a specified device (CRT or RFSP).

2.   Device Status — allows the user to verify the status of the peripherals. During this test the system checks the specified device to verify that it is physically connected to the reported port and that it is online.

The step by step procedures for the DIAG tests are described in paragraph 12.7.1.2.

12.4 STANDARDS AND TOLERANCES

All essential standards and tolerances related to the PC–RCU system are listed in table 12–4 and correspond with the applicable maintenance procedure paragraphs in section 12.6. The standards and tolerances prescribed in table 12–4 are based on equipment and monitor requirements and manufacturing specifications, use of standard test equipment, and standard measuring procedures. Equipment and monitor standards, tolerances, and limits are applicable to the equipment taken as a whole.

TABLE 12-4. STANDARDS AND TOLERANCES

| PARAMETER | REFERENCE | STANDARD | TOLERANCE LIMIT | |
			INITIAL	OPERATING
Data Flow Between Control Units	FDIO Software Interface Control Document (SICD)	Synchronous at 2400 bits per second (bps)	Minimum of 2400 bps	Same as Initial
Data Flow Between PC–RCU and CRT, RANK or RFSP	FDIO SICD	Asynchronous at 2400 bps	Minimum of. 2400 bps	Same as Initial
PC–RCU Power Consumption	PC User's Manual	Less than 115 W at between 100 V to 125 V ac	None	None

12.4.1 Definition of Terms

Parameter, reference, standard, initial tolerance limit, and operating tolerance limit, as used in table 12-4 are defined as follows:

a.   Parameter — The parameter is each system performance element that can be measured or tested to a particular standard.

b.   Reference — The reference lists the document or, if applicable, check procedure reference paragraph for checking the parameter against the listed standard.

c.   Standard — The standard is the optimum value assigned to an essential parameter of equipment. It is compatible with the system as a whole and the design capability of the equipment involved.

d.   Initial Tolerance Limit — The initial tolerance limit is the maximum deviation above and below the standard value of the parameter or the range that is permissible when the equipment is accepted for use in the NAS at the time of initial commissioning, or subsequent to any modification.

e.   Operating Tolerance Limit — The operating tolerance limit is the maximum deviation, above and below the standard value, over which the equipment may continue to operate without adjustment or corrective maintenance, and beyond which remedial action is required.

12.5   PERIODIC MAINTENANCE

This section lists all maintenance activities which are performed on a recurring basis to ensure optimum performance, to minimize interruption, and to avoid breakdown. This section is divided into three parts:

1.   Performance checks

   Performance checks provide for maintenance activities on a regular basis. Part of this mainte-
   nance activity is contained in the DIAGs during normal operation. These DIAGs are designed
   to indicate current system malfunctions. The performance checks which should be accom-
   plished on a routine basis are listed in table 12-5.

TABLE 12–5.   PERFORMANCE CHECKS

	REFERENCE	PARAGRAPH
PERFORMANCE CHECK	STANDARDS AND TOLERANCES	MAINTENANCE PROCEDURES
PC–RCU System Console Operation Observe the System Monitor for correct operation.	NONE	12.6.1.1
PC–RCU Switch Control Units Redundant Operation Check Perform PC-RCU switch to verify operation.	NONE	12.6.2.2
PC–RCU Power On Self Test Power-On Operation Check Perform PC–RCU power-on self-test.	NONE	12.6.2.3

2.   Other onsite maintenance tasks

   Other onsite maintenance tasks prevent the deterioration of equipment and ensure reliable
   operation of the system and equipment. These maintenance tasks are listed and described
   in table 12-6.

TABLE 12-6. OTHER ONSITE MAINTENANCE TASKS

ONSITE MAINTENANCE TASKS	REFERENCE	PARAGRAPH
	STANDARDS AND TOLERANCES	MAINTENANCE PROCEDURES
PC-RCU System Console Clean (1) Clean Exterior (2) Clean Screen	None	12.6.2.1

    3.   Offsite maintenance tasks

        Offsite maintenance tasks are tasks of a periodic nature that cannot be performed onsite and require removal of equipment to a central repair facility.

12.5.1 Performance Checks

Table 12-5 lists all required tests, measurements, and observations of normal operating controls and functions necessary to determine if the equipment is operating within established tolerances or limits.

12.5.2 Other Onsite Maintenance Tasks

Table 12-6 lists tasks necessary to prevent deterioration and to ensure reliable operation of the FDIO equipment.

12.5.3 Offsite Maintenance Tasks

Currently, there are no offsite maintenance tasks of a periodic nature on the PC-RCU system that require removal to a central repair facility.

12.6 MAINTENANCE PROCEDURES

This section consists of procedures required for accomplishing the various maintenance activities listed in tables 12-5 and 12-6. This section is divided into two parts:

    1.   Performance check procedures and

    2.   Cleaning procedures.

12.6.1 Performance Check Procedures

12.6.1.1 PC-RCU System Operations. Observe the system monitor for correct operational indications. If a message is reported on the monitor refer to paragraph 12.7.1.1.2 and table 12-7.

    a.   The correct indication of the system monitor text upon initialization is shown in figure 12-4.

        Where X.XX is the revision level of the software currently used in the system.

    b.   Contrast control

        1.   Turn control clockwise and observe the change in contrast.

2.   Turn control counterclockwise and observe change in contrast

3.   Set at desired level.

c.   Brightness Control

1.   Turn control clockwise and observe brightness change in screen.

2.   Turn control counterclockwise and observe brightness change in screen.

3.   Set control to desired level.

TABLE 12–7.   PC–RCU SYSTEM ERROR TABLE

Error	Level	Device	NAS Cat.	PC-RCU	Int Req	Error Text Messaae
4	0	Y	1	Y	N	INDETERMINATE ERROR
6	0	Y	1	Y	N	PRINTER OUT OF PAPER
7	0	Y	1	N	N	ILLEGAL DEVICE ADDRESS
9	0	Y	1	N	N	MESSAGE TIMED OUT
46	0	N	3	N	N	MODEM TRANSMITTER FAILED
47	0	N	3	N	N	MODEM RECEIVER FAILED
63	0	Y	1	N	N	ILLEGAL PERIPHERAL CONNECTED
64	0	Y	1	N	N	PERIPHERAL IS NOT READY
65	0	Y	1	N	N	PARITY ERROR ENCOUNTERED
66	0	Y	1	N	N	PERIPHERAL IS OFFLINE
67	0	Y	1	N	N	DEVICE FAULT
69	0	N	3	N	Y	WARNING: INVALID CONFIGURATION
80	0	N	3	Y	N	DISK FAILURE
81	0	N	1	Y	Y	MULTI 1/0 BOARD A FAILURE
82	0	Y	1	Y	Y	UART FAILURE
83	0	Y	1	N	N	DEVICE NOT PRESENT
84	0	N	3	N	N	SYSTEM INITIALIZATION COMPLETE
85	0	N	1	Y	Y	MULTI I/O BOARD B FAILURE

12.6.2   Cleaning Procedures

12.6.2.1   PC–RCU System Console Cleaning Procedures

a.   Wipe system console monitor and keyboard with a damp, lint free cloth. Do not use harsh cleaning agents.

b.   Dampen lint free cloth with alcohol or other antistatic cleaning agent, and gently wipe face of the system monitor.

c.   Allow unit to dry before turning on power.

12.6.2.2   PC–RCU Switch Control Units Procedure

a.   On the Black Box Switching System ensure that the key that unlocks the switches is in the unlocked position.

b.   Flip the master gang switch to the system that is currently the secondary PC–RCU.

c.   Confirm that the old primary PC–RCU becomes the secondary PC–RCU and the old secondary PC-RCU becomes the primary PC-RCU by observing the unit status in the bottom right hand corner of the PC-RCU system console screen (this may take up to 5 seconds).

d.   On the new primary PC-RCU perform Device Status and/or Canned Message diagnostics on the peripheral devices. Refer to paragraph 12.7.1.2 for procedures.

e.   Enter a Test Device (TD) message from an operational RANK to verify connectivity to Host.

f.   Protect switches from inadvertent switching by locking the ganged switch.

12.6.2.3   PC–RCU Power On Self Test (POST) Procedure

a.   Power off and back on the secondary PC–RCU using the APC SurgeArrest power switch. DO NOT use the PC-RCU reset button. Wait until the SYSTEM INITIALIZATION COMPLETE and MODEM TRANMITTER FAILURE messages are displayed in the error logger.

NOTE

The MODEM TRANSMITTER FAILURE message is normal when the unit is in secondary status because is has no modem connection.

b.   On the Black Box Switching System ensure that the key that unlocks the switches is in the unlocked position.

c.   Flip the master gang switch to the system that is currently the secondary PC–RCU.

d.   Confirm that the old primary PC-RCU becomes the secondary PC-RCU and the old secondary PC-RCU becomes the primary PC-RCU by observing the unit status in the bottom right hand corner of the PC-RCU system console screen (this may take up to 5 seconds).

e.   On the new primary PC-RCU perform Device Status and/or Canned Message diagnostics on the peripheral devices. Refer to paragraph 12.7.1.2 for procedures.

f.   Enter a Test Device (TD) message from an operational RANK to verify connectivity to Host.

g.   Power off and back on the new secondary PC-RCU using the APC SurgeArrest power switch. Verify that the SYSTEM INITIALIZATION COMPLETE and MODEM TRANSMITTER FAILURE messages are displayed in the error logger.

h.   Protect switches from inadvertent switching by locking the ganged switch.

12.7   CORRECTIVE MAINTENANCE

This section provides step-by-step instructions to diagnose, isolate, and correct faults in the PC-RCU. Included are built-in DIAG program descriptions and troubleshooting procedures.

Refer to the individual vendor's service/technical manuals for detailed information, such as, schematic diagrams, circuit board layout pictorials, and wiring diagrams, for peripherals, modems, I/O boards, and the PC.

Mandatory maintenance requirements for the PC-RCU system are located in section 12.6. After replacement of any peripheral, board, or cable, applicable DIAG programs (see paragraph 12.7.1.2) must be run to verify correct operation of the system.

12.7.1   Onsite Corrective Maintenance

The following paragraphs identify the source of operation problems in the PC-RCU system. PC-RCU system problems are classified into the following categories:

   a. Control unit,

   b. peripheral, and

   c. communications.

Troubleshooting should initially be isolated to one of these areas. If a back up system is available through the Black Box Automatic Switching System and the failure has been isolated to the control unit, service can be restored by switching to the redundant system and troubleshooting can be performed on the failed unit offline. Paragraphs 12.7.1.1. through 12.7.1.1.2 provide information for identifying the problem source.

12.7.1.1   Isolating Control Unit Failures.   Control unit failure can be the result of the PC, the peripheral interface board, or the MPA–100 I/O board.

12.7.1.1.1   PC Failure.   In the event of a hard drive failure, the PC-RCU system can be run from floppy drive A:. If a 80 DISK FAILURE error message is posted to the system console or if problems exist booting from the hard drive, try rebooting from floppy drive A: using PC-RCU system backup Disk 2.

12.7.1.1.2   PC-RCU System Errors,   This paragraph will describe the system errors processed by the PC-RCU system. Table 12–7 lists the system errors and table 12–8 defines the system errors for the PC-RCU. The six headings and error numbers in table 12–7 are defined **as** follows:

   a. Level:

   > 0 = non-fatal error — does not impede system operation
   > 1 = fatal error — impedes system operation

   b. Device — indicates whether a peripheral device is involved (yes or no)

   c. NAS category:

   > 1 = sends error to NAS each time error occurs
   > 2 = sends error to NAS only on the first occurrence
   > 3 = sends error to PC-RCU system monitor only

NOTE

All system and device error messages are sent to the system monitor.

   d. PC-RCU — indicates whether the PC-RCU address is inserted in the error message by the CCU before being sent to NAS.

   e. Int Req — intervention required.

   f. Error Text Message — description of errors.

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TABLE 12-8. SYSTEM ERRORS DEFINED

Error	Definition
04	**Indeterminate Error — NAS C1/SM** The PC-RCU has detected a peripheral error. The peripheral device status table is scanned and a Text Ack with Error (type 11) message was returned but no peripheral error status could be determined.
06	**Printer Out of Paper — NAS C1/SM — Int Req** The PC-RCU software has detected an **out of paper** bit set in the status word returned from a printer.
07	**Illegal Device Address — NAS C1/SM** The PC-RCU detects an invalid destination.
09	**Message Timed Out — NAS C1/SM** A PC-RCU associated peripheral fails to acknowledge a message within an allotted time.
46	**Modem Transmitter Failed — NAS C3/SM** Transmissions to the CCU from the PC-RCU have been attempted two times and failed.
47	**Modem Receiver Failed — NAS C3/SM** The PC-RCU attempted to transmit a message two times and failed. The PC-RCU failed to receive the ADCCP link-level acknowledgement from the CCU.
63	**Illegal Peripheral Connected — NAS C1/SM** The device type returned from the peripheral is not compatible with the address (device number) it is associated with as per the RECN table. i.e., an RFSP configured to a RANK device number (16 — 20).
64	**Peripheral Is Not Ready — NAS C1/SM** The PC-RCU device status word indicates the attached peripheral is not ready during the last attempted access.
65	**Parity Error Encountered — NAS C1/SM** The peripheral status returned indicates a parity error has occurred during the last peripheral data transfer.
66	**Peripheral Is Offline — NAS C1/SM** The peripheral status indicates an offline condition existed during the last attempted peripheral access.
67	**Device Fault — NAS C1/SM** The peripheral status reports a device fault, i.e. Headjam, condition existed during the last attempted peripheral access.

TABLE 12-8. SYSTEM ERRORS DEFINED (Continued)

Error	Definition

69   Warning: Invalid Configuration — NAS C3/SM — **Int Reg**
The PC-RCU detected minimum configuration requirements of at least one RANK and one RFSP or CRT not available.

80   Disk Failure — NAS C3/SM
The disk failure message signifies a problem reading from or writing to disk.

81   Multi I/O Board A Failure — NAS C1/SM — **Int Req**
All Universal Asynchronous Receiver Transmitters (UART) on the peripheral interface board have failed.

82   UART Failure — NAS C1/SM — **Int Req**
A problem exists with one of the UART chips on the peripheral interface board.

83   Device Not Present — NAS C1/SM
The device solicited was not found in the PC-RCU configuration table.

84   System Initialization Complete — NAS C3/SM
Signifies successful initialization of PC-RCU.

85   Multi I/O Board B Failure — NAS C1/SM — **Int Req**
All UARTs on the peripheral interface board have failed.

12.7.1.2 DIAG

The DIAG procedures can be run from the system console allowing the user to select and run specific tests to checkout peripheral status, and to verify proper communication with peripheral devices.

To enter the DIAG mode, press Function key F4 from the MAIN MENU. This will place the system in DIAG mode with the screen displayed in figure 12-6.

Two tests can be run while in DIAG mode, Device Status and Canned Message.

FDIO PC–RCU	Version x.x DOMESTIC/OCEANIC CFG

DIAGNOSTICS:

ESC	Main Menu
F1	Canned message
F3	Device status

PRIMARY/SECONDARY

FIGURE 12-6.   DIAGNOSTIC MENU

12.7.1.2.1 Canned Message Test Procedures

Steps

1   Press Function key F1 from the DIAGNOSTIC MENU. The system will respond with the current configuration and the following prompt in the menu display area:

Which Device?

NOTE

A canned message can only be sent to an RFSP or a CRT.

2   Enter the device number of the peripheral that the canned message will be sent. The system will respond with the following prompt in the menu display area:

Device (dev #)
How many iterations
(1 - 99)?

NOTE

(dev #) = device number.

3   Enter the number of canned messages to be sent. Pressing ENTER will begin this test.

4   For each message that is successfully sent and acknowledged the system will respond with the following:

Test msg # (iteration #) ACK OK

The following is an example of the domestic configured full strip canned message:

RCU# :05 DEVICE# : 02 | DIAG
TAB / RIBBON   TEST

TABS   ↑15   ↑22

ABCDEFGHIJKLMNOPQRST
UVWXYZ1234567890
ABCDEFGHI$JKLMNOPQRST
UVWXYZ1234567890
↑32 O↑↓⊕/@*. + − O↑↓⊕/@*. + −   ↑62   ↑66

The following is an example of the domestic configured half strip canned message:

RCU# :05 DEVICE# : 01 | DIAG
TAB / RIBBON   TEST

TABS   ↑10 ↑15   ↑22

ABCDEFGHIJKLMNOPQRSTUVWXYZ
1234567890ABCDEFGHIJKLMNOP
QRSTUVWXYZ1234567890
O↑↓⊕/@*. + − O↑↓⊕/@*. + −
↑32   ↑41   ↑58

The following is an example of the oceanic configured canned message:

```
RCU# :01  DEVICE# :01                    DIAG  ABCDEFGHIJKLMNOPQRST
   TAB/ RIBBON         TEST                     UVWXYZ1234567890
                                                ABCDEFGHIJKLMNOPQRST
TABS          ↑12    ↑18              ↑39      UVWXYZ1234567890              ↑65
                                                0↑↓⊕/@*.+ −  0↑↓⊕/@*.+ −
```

Steps (Cont.)

5   For each message that is not properly received or acknowledged the system will respond with the error condition explaining why. Refer to table 12-7 for the listing of error conditions.

6   Pressing Function key F9 will return the system to the DIAGNOSTIC MENU. Pressing the ESC key will return the system to Main Mode.

12.7.1.2.2   Device Status Test Procedures

Steps

1   Press Function key F3 from the DIAGNOSTIC MENU for the Device Status Test. The system will respond with the current configuration and the following prompt in the menu display area:

Which Device?

2   Enter the device number of the device that is being checked for status. The system will respond with the status of the device. Refer to figure 12-7 for example.

3   If the proper response to the status request is not received the system will respond with an error condition. Refer to table 12-7 for the listing of error conditions.

4   Pressing Function key F9 will return the system to the DIAGNOSTIC MENU. Pressing the ESC key will return the system to Main Mode.

```
+--------------------------------------------------------------------+
|  +--------------------------------------------------------------+  |
|  |                                                              |  |
|  |   FDIO PC-RCU              Version x.x    DOMESTIC/OCEANIC CFG|  |
|  |                                                              |  |
|  +--------------------------------------------------------------+  |
|  +----------------------------+  +----------------------------+    |
|  |    DEVICE STATUS:          |  |    STATUS:                 |    |
|  +----------------------------+  +----------------------------+    |
|                                                                    |
|    +-----+                        Device number (dev #)            |
|    | ESC |   Main Menu               Assigned to UART (UART #),    |
|    +-----+                              port (port #)              |
|    +-----+                          Connected device is            |
|    | F9  |   DIAGNOSTIC MENU            (peripheral type)          |
|    +-----+                                                         |
|                                                                    |
|    Device (dev #)                   Status:                        |
|    Press any key                       (device status)            |
|    to continue                                                     |
|                                                                    |
|                                                                    |
|  +----------------------------------------------------------------+|
|  |                                            PRIMARY/SECONDARY   ||
|  +----------------------------------------------------------------+|
+--------------------------------------------------------------------+
```

FIGURE 12-7.   DEVICE STATUS DISPLAY

12.7.2   Isolating Peripheral Failures

12.7.2.1   General.   The DIAG Tests (Canned Message and Device Status; see paragraph 12.7.1.2) allow the technician or operator to identify an RFSP, CRT, or RANK failure or to verify correct operation. In addition, the RFSP features built-in self test and DIAGs (refer to RFSP manuals listed in paragraph 2.1.5.4.1).

12.7.2.2   Lightning Surge Protection.   The design of the lightning protection block provides a continuous signal path from the male jacks to the female jacks whether or not the surge protector module is plugged in.

If lightning surge protection is suspected for a peripheral failure, use one of the following steps for isolation:

Steps

1.   Remove the three surge protection modules associated with the peripheral. Reference 12.7.7.4 for removal procedures. If the problem clears replace the surge protection modules. Reference 12.7.7.4 for replacement procedures.

2.   The associated peripheral male and female plugs can be removed from the lightning protection block and can be plugged together to completely isolate the lightning protection. If the problem clears, replace the associated surge protectors. Reference 12.7.7.4 for removal and replacement procedures.

NOTE

The lightning surge protector modules at both ends of the vertical run must be checked.

12.7.3   Isolating Telephone Company (TELCO) Failures

If a bad modem is suspected, contact the ARTCC. Ask them to perform the BC Query Test from the CCU front panel. The results BC STAT 01, PER STAT 04 indicate a problem existing in the TELCO or modem link. Ensure modem is configured to clock data on pin 15 (TxCLK). Refer to figure 12-9 for proper cable pin out. If problem still exists, contact the local FAA representative for modem repair.

12.7.4   Isolating Peripheral Interface Board Failures

The DIAG Tests (Canned Message and Device Status; see paragraph 12.7.1.2) allow the technician or operator to verify correct communication between the PC-RCU and the attached peripheral elements. If a MULTI 1/0 BOARD FAILURE (error number 81 or 85) message is received or if a 82 UART FAILURE message is received the peripheral interface board may not be installed properly. Refer to paragraph 12.9.3.3.1 (Star Gate Plus-8) or paragraph 12.9.3.3.2 (Digi International Classic Board 8) for installation and configuration procedures. If correctly installed and configured and problems still exist replace the peripheral interface board.

12.7.5   Isolating MPA-100 Board Failures

If a communication problem exists between the CCU at the ARTCC and the PC-RCU the failure could be either with the TELCO communication or with the MPA-100 board. First ensure modem is configured to clock data on pin 15 (TxCLK). Refer to figure 12-8 for proper cable pin out. Next ensure that the MPA-100 board is also properly configured and installed as per instructions in paragraph 12.9.3.4. If problem still exists replace the MPA-100 board.

SGND	1		1
TxD	2		2
RxD	3		3
TxCLK	15		**4**
RxCLK	17		5
TxCLK	24		6
DGND	7		7
RTS	4		**8**
CTS	5		9
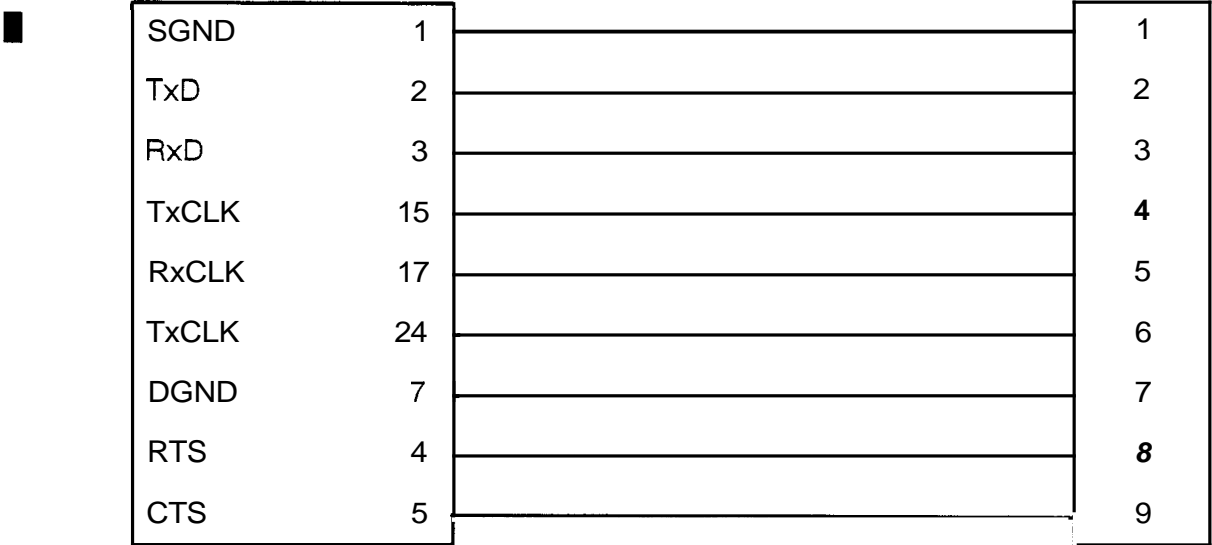
FIGURE 12-8.   SWITCH TO MPA-100 (QUATECH CARD) CABLE PINOUT (M1)

1		1	SGND
2		2	RxD
3		3	TxD
4		15	TxCLK
5		17	RxCLK
6		24	TxCLK
7		7	DGND
8		4	CTS
9		5	RTS
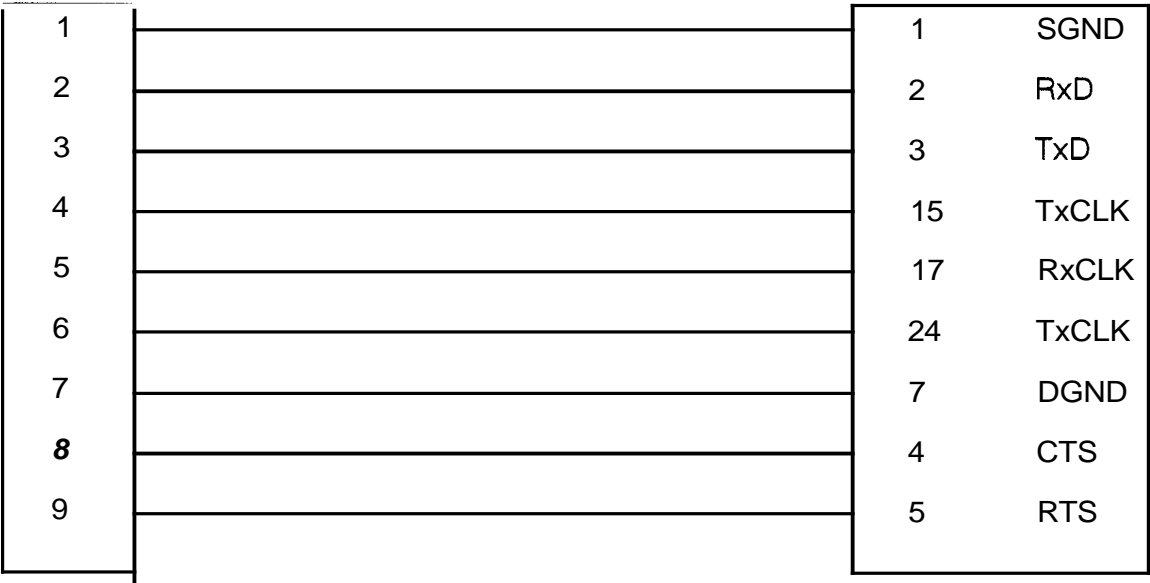
FIGURE 12-9.   SWITCH TO MODEM CABLE PINOUT (M2)

12.7.6   SEL Operational Procedures

The SEL allows the technician or operator to view stored errors on the system console or to print them out on an assigned RFSP. Errors can also be cleared from the SEL.

12.7.6.1   Listing Errors

<u>Steps</u>

1. Press Function key F6 from the MAIN MENU. The system will respond with the following prompt in the menu display area:

    F1 System Errors

    F2 Device Errors

2. Press Function key F1 to list System Errors or press Function key F2 to list Device Errors. If the F1 key is pressed for System Errors, then skip step 3 and step 4 of paragraph 12.7.6.1.

3. If the F2 key is pressed for Device Errors, the system will respond with the following prompt:

    Which Device?

4. Enter the device number.

5. The system will respond with the following:

    F2 List Errors

    F4 Clear

6. To list the errors press Function key F2. The system will respond with the following prompt:

    F1 Sys Console

    F3 Error Logger

7. To view the errors on the system console press Function key F1. To get **a** hard copy printout of the errors press Function F3 key.

NOTE

An Error Logger device must be configured before errors can be viewed or printed.

If more than one screen of errors is stored, the system will signify that there are MORE errors. Pressing Function key F10 will display the next screen of errors.

a. The system will signify that it is done displaying or printing the error file. At this point, pressing any key will return the system to the menu displayed in step 1 of paragraph 12.7.6.1. The ESC key will return the system to the MAIN MENU.

12.7.6.2   Clearing the Error Logger

<u>Steps</u>

1. Refer to steps 1 through 5 of the List Errors procedure in paragraph 12.7.6.1.

2. Press Function key F4 and the system will clear the Error Logger file.

3. The system will signify that it is done clearing the file. At this point, pressing any key will return the system to the ERROR HISTORY MENU. The ESC key will now return the system to the MAIN MENU.

12.7.7 Removal and Replacement Procedures

Paragraphs 12.7.7.1 through 12.7.7.4.2 provide instructions to remove and replace PC-RCU system circuit boards, modules, and peripherals.

12.7.7.1 Peripheral Interface Board. Use the following procedures to remove and replace a peripheral interface board.

12.7.7.1.1 Removal

Steps

1. Ensure power is off to system.

2. Remove Octa Cable Assembly or remote panel cable from the connector on the peripheral interface board.

3. Remove the cabinet retaining screws.

4. Remove PC cover, removing carefully to avoid catching any internal cables.

5. Loosen and remove the retaining screw that fastens the peripheral interface board to·the cabinet.

6. Hold on to the left and right edges of the board and remove the board from the expansion slot with a slight rocking motion.

12.7.7.1.2 Replacement. Replacement is the reverse of the removal procedure.

12.7.7.2 Peripheral Interface Remote Panel. Use the following procedures to remove and replace a peripheral interface remote panel.

12.7.7.2.1 Removal

Steps

1. Ensure power **is** off to the system.

2. Remove cable from the DB25 connector on the remote panel.

3. Mark peripheral cables so that they can be matched with the proper port when reconnected.

4. Remove all peripheral cables.

5. Remove panel.

12.7.7.2.2 Replacement. Replacement is the reverse of the removal procedure.

12.7.7.3 **MPA–100** Circuit Board. Use the following procedures to remove and replace a MPA-100 board.

12.7.7.3.1 Removal

Steps

1. Ensure power is off to system.

2. Remove the cable from the DB25 connector on the MPA–100 board.

3. Remove the cabinet retaining screws.

4. Remove PC cover, removing carefully to avoid catching any internal cables.

5. Loosen and remove the retaining screw that fastens the MPA-100 board to the cabinet.

6. With your fingers on the left and right edges of the board remove the board from the expansion slot with a slight rocking motion.

12.7.7.3.2 Replacement. Replacement is the reverse of the removal procedure in paragraph 12.7.7.3.1.

12.7.7.4 Lightning Surge Protection Module. Use the following procedures to remove and re-place a lightning surge protection module.

12.7.7.4.1 Removal

Steps

1. Remove ground screw from surge protection module.

2. Loosen ground screws on remaining surge protection modules in the protection block.

3. Lift the ground bus bar from all the surge protection modules.

4. Pull out surge protection module from the punch down block. Note orientation of module for proper replacement.

12.7.7.4.2 Replacement. Replacement is the reverse of the removal procedure in paragraph 12.7.7.4.1.

12.8 PARTS **LIST**

This section contains descriptive and source data necessary for procurement of replaceable parts used in the PC–RCU system.

12.8.1 Parts List Table

Name of Part/Description	National Stock Number/Part Number
Management System Services, Inc. System	8200-00-000-75671
Management Systems Services, Inc. PC only	7021-01-454-9295
Monitor, TV	7025-01-454-9296
Keyboard, Data Entry	7025-01-454-9293
TI-FDIO (Power cable & manual)	0056-00-480-04441
System 3000 Model 3230 PC	7035-01-391-50651
Monitor, TV	5820-01-437-3968
Keyboard, Data Entry	5999-01-437-3434
Disk Drive Unit	7025-01-437-3436
Circuit Card Assy (Quatech MPA-100 Board)	5998-01-375-7651
Star Gate PLUS-8 Board and Remote Panel	5998-01-375-7617
Digi ClassicBoard 8	5998-01-446-4893
A/B Switch (Automatic Rack Chassis)	5930-01-445-7835
A/B Switch Supply Card Power	5930-01-445-7832
Power Supply Cable/Transformer	6130-01-478-5227
A/B DB9 Switch Card	5930-01-445-7836
Diskette, PC-RCU Software	9070-00-458-7203
Shelf for Wespercorp Cabinet	5975-01-339-9649
Modem Cable (M1, Figure 12-8)	4920-01-455-9288
Stargate/Digi Conversion Cable (Figure 12-18)	5995-01-457-6612
APC SurgeArrest Rackmout (Figure 12-12)	5920-01-469-3058
Lightning Surge Protection Modules (LINX UP1-16)	6150-01-494-7343

12.9   INSTALLATION, INTEGRATION, CHECKOUT

This section includes material directly related to the installation, integration, and checkout of the PC-RCU system.

12.9.1   Unpacking and Repacking

12.9.1.1   PC-RCU System Packing and Unpacking

12.9.1.1.1   PC Packing and Unpacking.   The PC will be packaged in its original shipping containers. The procedure to pack the PC is as follows:

a.   The packing carton is opened at the top. **All** packing materials will be removed.

b.   Pack the system console keyboard as per instructions in paragraph 12.9.1.1.3.

c.   Place keyboard box in one end of the box. Place box in which documentation, mouse, and software were packed, in the other end of the box.

d.   Place styrofoam corners in the corners of the box.

e.   Wrap PC in anti-static bag. Fold over end and tape to seal.

f.   Carefully place the PC into the container.

g.   Fold over flaps at top of container (large flaps last) and seal with shipping strength tape.

The PC is unpacked in the reverse order. Care should be used in cutting the top edge of the box not to exceed 1/4-inch depth with the cutting edge. Packing materials should be stored inside the box and the **box** stored in a dry area in case it is ever necessary to transport the PC.

12.9.1.1.2   System Console Monitor Packing and Unpacking.   The monitor will be packaged in its original shipping containers. The procedure to pack the monitor is as follows:

a.   The packing carton is opened at the top. **All** packing materials will be removed.

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12.9.1.1.3   System Console Keyboard Packing and Unpacking.   The keyboard will be packaged in its original shipping containers. The procedure to pack the keyboard is as follows:

a.   The packing carton is opened at the top. All packing materials will be removed.

b.   Wrap keyboard in anti-static bag. Fold over end and tape to seal.

c.   Carefully place the keyboard into the container.

d.   Fold over flaps at top of container and seal with shipping strength tape.

The keyboard is unpacked in the reverse order. Care should be used in cutting the top edge of the box not to exceed 1/4-inch depth with the cutting edge. Packing materials should be stored inside the box and the box stored in a dry area in case it is ever necessary to transport the keyboard.

12.9.2   Input Requirement Summary

A summary of the input data is shown in tables 12-9 and 12-10. Environmental considerations are listed on table 12-11.

TABLE 12-9.   ELECTRICAL CHARACTERISTICS OF FDIO EQUIPMENT

ELEMENT	MAX CURRENT (AMP)	VOLTAGE	WATTS	POWER FACTOR	SURGE CURRENT (AMP)
PC–RCU	4.0	115 V ac	68.10	0.76	5.50

TABLE 12-10.   POWERPANEL CONNECTION ELECTRICAL REQUIREMENTS

ELEMENT	REQUIREMENT
PC–RCU	1 – 15 amp circuit on essential or critical power, 115 – V ac (± 10%) input

TABLE 12-11.   ENVIRONMENTAL CONSIDERATIONS FOR FDIO EQUIPMENT

Ambient Temperature:	59-90 Fahrenheit degrees
Relative Humidity:	20-80% noncondensing

12.9.3   Installation Procedures

Prior to the scheduled installation date ensure the following requirements have been met:

a.   Modem lines are in place.

b.   Modem is, whenever possible, within 50 cable-feet of designated PC–RCU system location. Refer to figure 12-9 for pinout of modem cable.

NOTE

If converting Wespercorp RCU to a PC–RCU, the M1 cable as described in figure 12-8 can be used to convert the existing RCU to modem cable provided that the necessary pins are available in the existing cable.

c. All cable trays, circuit breakers, and conduit necessary to connect the appropriate cables from the PC-RCU system to all peripheral locations are installed. Refer to figure 12–14 for pin out of peripheral cable.

NOTE

If converting Wespercorp RCU to a PC–RCU configuration, new peripheral cables are not needed. The same pinout applies to the Digi International, Inc. peripheral interface board.

d. Console space in operations room is adequate for peripheral elements.

e. One 115 V ac (+ 10 percent) outlet on essential or critical power is located within 6-feet of each peripheral location.

f. Ensure PC–RCU cabinet is installed at desired location. If converting Wespercorp RCU to a PC–RCU configuration, ensure that all contents of Wespercorp cabinet are removed. Refer to section 7.4 of this manual for removal procedures. Refer to figures 12–1 or 12-2 for configuration of shelves.

g. Ensure two separate 115 V ac (± 10 percent) circuits are installed for each PC RCU System (one for each PC). Refer to figure 12–12 for proper power configuration.


PLUS-8 Remote Panel DB-9M		Switch A/B Port DB-9M
Rx–	2	2
Rx+	9	9
Tx–	7	7
Tx+	4	4
SGND	5	5
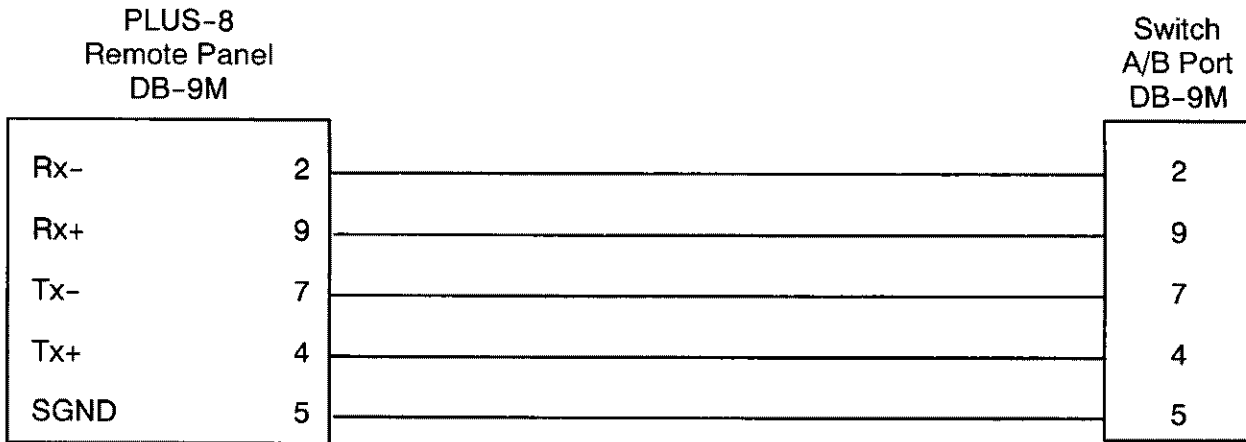
FIGURE 12-10.   PLUS-8 PANEL TO SWITCH CABLE PINOUT (P1)

Switch
"COM" Port
DB-9M   Peripheral
                                         DB-25M

| 2 | | 19 | Tx- |
9		25	Tx+
7		15	Rx-
4		17	Rx+
5		NO CONNECTION	
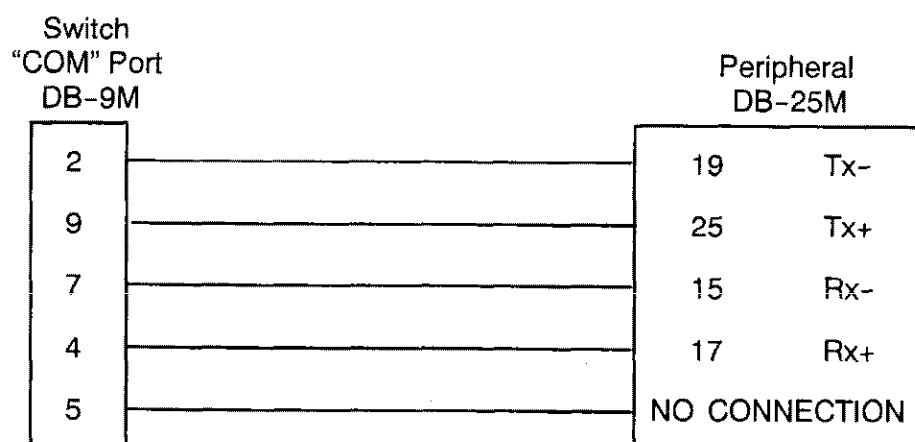
FIGURE 12-11.   SWITCH TO PERIPHERAL (P2)

NOTE

This pinout is to be used in conjunction with cable P1 and the Star Gate PLUS-8
peripheral interface board. If using the Digi International ClassicBoard 8, refer
to figures 12-13 and 12-14.

Power For PC-RCU
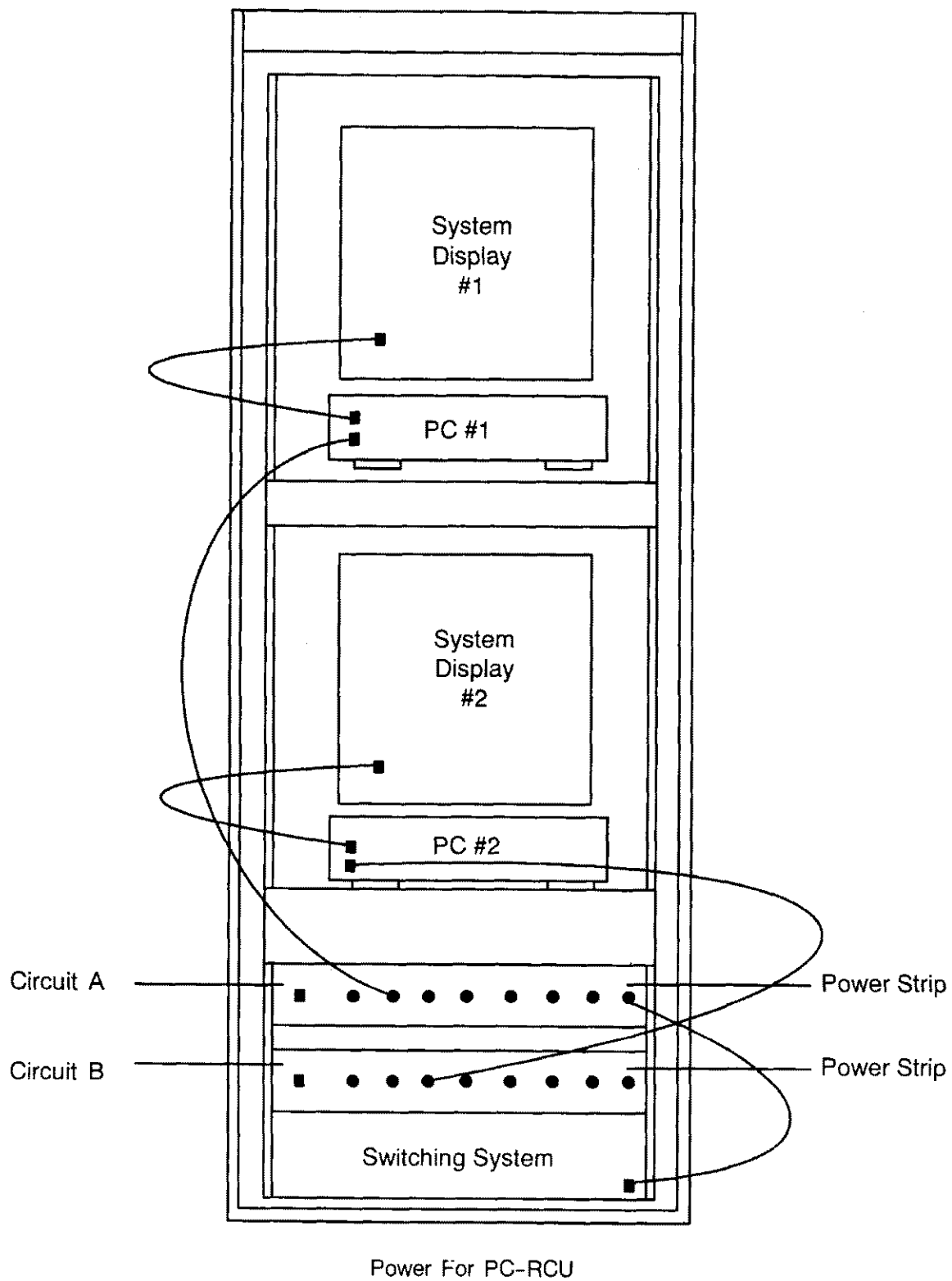
FIGURE 12-12.   PC-RCU POWER CONFIGURATION

Digi
Octa-Cable
DB-9M

Rx–	9
Rx	8
Tx–	7
Tx+	6
SGND	5

FIGURE 12-13.   DIGI OCTA CABLE DB-9M PINOUT

Switch
"COM" Port
DB-9M

Peripheral
DB-25M

|		
9	19	Tx–
8	25	Tx+
7	15	Rx–
6	17	Rx+
5	NO CONNECTION	
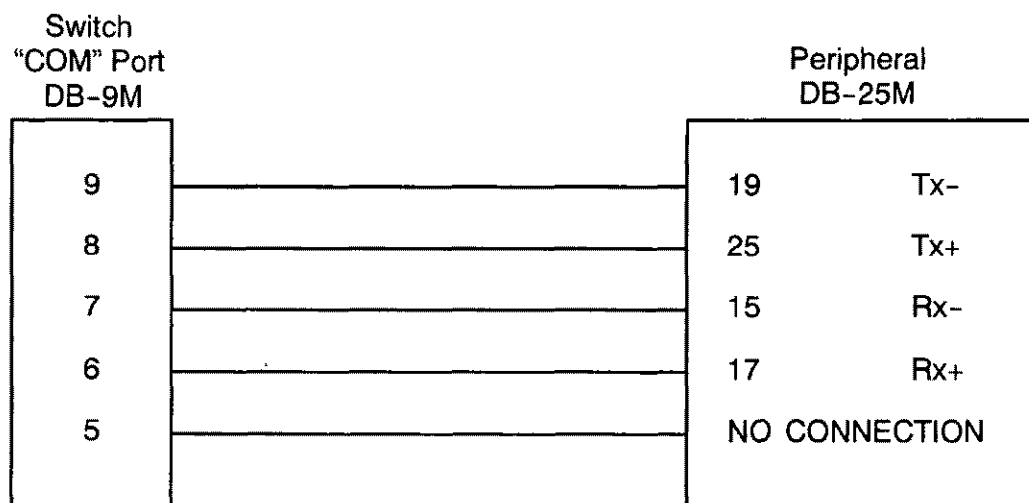
FIGURE 12-14.   SWITCH TO PERIPHERAL (P2A)

NOTE

This pinout is to be used in conjunction with the Digi ClassicBoard 8 Octa Cable Assembly pinout as described in figure 12-13. If using the Stargate PLUS-8 peripheral interface board refer to figures 12-10 and 12-11.

The procedure for PC-RCU installation is as follows:

Steps

Configure PCs

1   Configure the Qua Tech MPA-100 RS-232 synchronous communication board as per instructions in paragraph 12.9.3.4, figures 12-19 and 12-20.

2   If using Star Gate PLUS-8 peripheral interface board(s) configure as per instructions in paragraph 12.9.3.3.1, figures 12-15 and 12-16. If using Digi International ClassicBoard 8 no hardware configuration is needed. Software configurations will be completed in step 7 of paragraph 12.9.3.

3   After the boards have been configured, label the boards so that they can be distinguished at the rear panel of the PC.

4   Install the boards in the PC unit's expansion slots.

5   Install system monitor by connecting the monitor signal cable to the video connector located on the PC-RCU rear panel.

6   Install the system keyboard by connecting the keyboard cable to the keyboard connector located on the PC-RCU rear panel.

7   Connect to power source. Refer to figure 12-12 for power configuration. Power ON PC to ensure it powers on without error. Also, if using Digi International ClassicBoard 8 peripheral interface board, run board configuration software that is supplied with the board to verify proper settings. Refer to section 12.9.3.3.2 for proper Interrupt Request (IRQ) and address settings.

8   Repeat steps 1 through 8 of paragraph 12.9.3 to assemble second PC-RCU system.

Prepare peripherals

9   If peripherals are already installed continue with step 14 of paragraph 12.9.3.

10   All peripheral elements will be brought to the appropriate PC-RCU location.

11   Unpack elements in accordance with paragraph 9.4.

12   Visually inspect the peripheral elements for any signs of damage during moving operations.

13   Connect power and power up each peripheral element and run self-DIAGs.

zw

A-Board Conf.

SW1 SEE TEXT

SW1

B-Board Cfg.

SW1 SEE TEXT
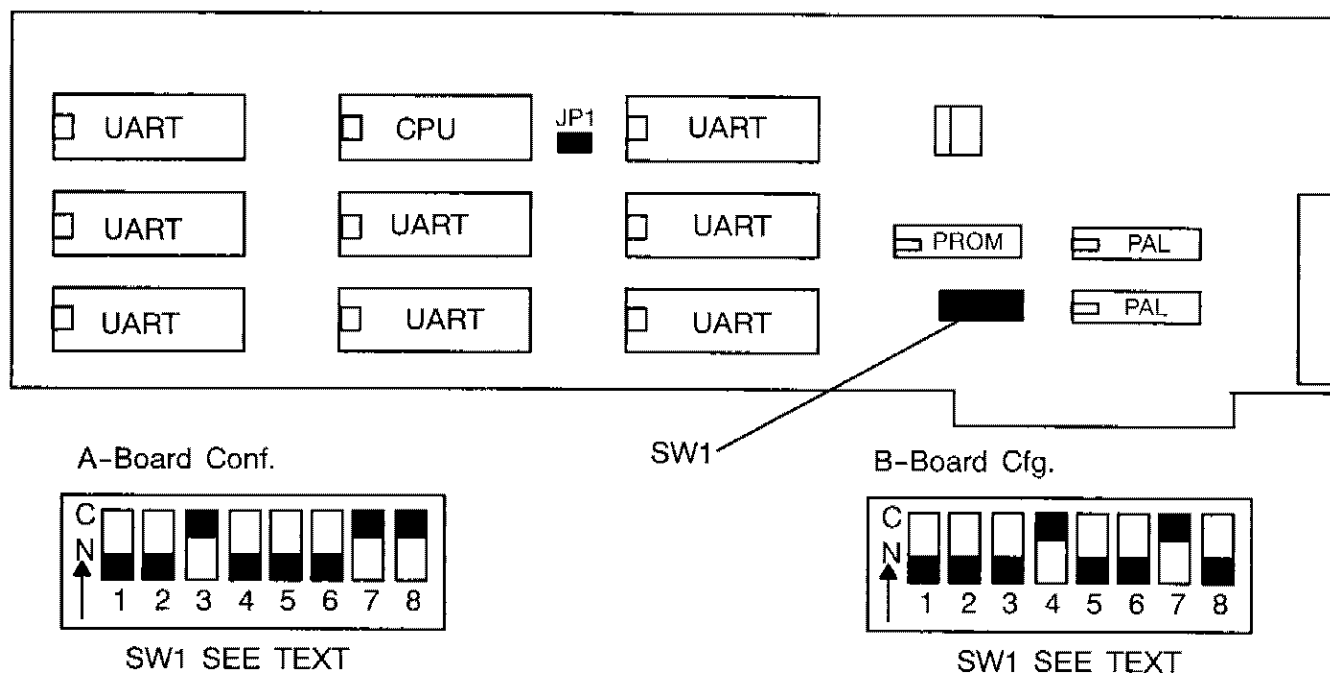
FIGURE 12-15.   PLUS-8 BOARD SWITCH SETTINGS

A-Board Cfg		B-Board Cfg	
Switch S1		Switch S1	
1 — off		1 — off	
2 — off		2 — off	
3 — on	Interrupts on IRQ4	3 — off	
4 — off		4 — on	Interrupts on IRQ5
5 — off		5 — off	
6 — off		6 — off	
7 — on	Allows interrupts	7 — on	Allows interrupts
8 — on	Primary address map	8 — off	Secondary address map

FIGURE 12-16.   PLUS-8 BOARD SWITCH SETTINGS

Steps (Cont.)

Configure Ganged A/B Switch

14   Install power supply card in rack chassis.

15   Install DB9 A/B switch cards in rack chassis. One for each peripheral plus one for the modem interface.

Install Equipment in Cabinet

16   Install automatic rack chassis in PC-RCU cabinet at the location specified in figure 12-1 or 12-2.

17   Install PCs in PC-RCU cabinet at locations specified in figure 12-1 or 12-2.

Connect Cables

18   If installing Stargate PLUS-8 peripheral interface board(s), complete installation by connecting the remote panel using the supplied interconnect cable.

NOTE

This cable is not a straight through cable and improper installation can cause damage to the remote panel. Refer to label on cable for proper connection procedures.

If installing the Digi International ClassicBoard 8 connect the Octa-Cable Assembly supplied.

19   Connect cable from the corresponding port of the peripheral interface board of the **B** PC-RCU system to port B on its corresponding A/B switch card. Repeat for each peripheral. Refer to figure 12-3 for diagram. If using the Star Gate PLUS-8 refer to figure 12-10 for pinout of this cable. If using the Digi International ClassicBoard 8 no additional cable is needed. Connect the corresponding 9-pin connector (figure 12-13) from the Octa-Cable Assembly directly to the corresponding port on the switch card.

20   Connect cable (M1) from the Qua Tech MPA-100 card of the **B** PC-RCU system to port B on its corresponding A/B switch card. Refer to figure 12-3 for diagram and figure 12-8 for pin outs.

21   Connect cable from the corresponding port of the peripheral interface board of the **A** PC-RCU system to port A on its corresponding A/B switch card. Repeat for each peripheral. Refer to figure 12-3 for diagram. If using the Star Gate PLUS-8 refer to figure 12-10 for pinout of this cable. If using the Digi International ClassicBoard 8 no additional cable is needed. Connect the corresponding 9-pin connector (figure 12-13) from the Octa-Cable Assembly directly to the corresponding port on the switch card.

22   Connect cable (M1) from the Qua Tech MPA-100 card of the **A** PC-RCU system to port A on its corresponding A/B switch card. Refer to figure 12-3 for diagram and figure 12-8 for pin outs.

23   Connect cables from peripherals to the main port on the corresponding A/B switch card. If using the Star Gate PLUS-8 peripheral interface board refer to figure 12-11 for pin out of cable P2. If using the Digi International ClassicBoard 8 peripheral interface board refer to figure 12-14 for pin out of cable P2A.

Steps **(Cont.)**

24   Connect cable (M2) from the modem to the main port on the corresponding A/B switch card.

25   Power ON the switch and ensure master switch is set to A.

26   Perform steps 27 through 30 of paragraph 12.9.3. Throw master switch to B and repeat steps 27 through 30.

27   Connect power to PC and monitor and power up both.

28   Install PC–RCU system software as described in paragraph 12.9.3.2.

29   Power the PC OFF and back ON. Verify that the 84 SYSTEM INITIALIZATION COMPLETE message appears on the system console. Run the applicable DIAGs on peripheral elements. Refer to paragraph 12.7.1.2 for procedures. The PC–RCU will create a configuration file (NRECN.CFG) based on the connected peripherals it detects on initial power up. Verify that the configuration is correct. If it is not configure the peripherals manually. Refer to paragraph 12.3.4.5 for configuration procedures.

30   Run FDIO DIAGs from ARTCC to verify online.

12.9.3.1   PC–RCU Software.   The PC–RCU software is delivered on one 3.5-inch 1.44-Mb floppy install disk.

   a.   Executing the install will perform the following procedures:

      1.   Create a bootable VRTX Hard Disk

      2.   Save a backup copy of the hard disk's current partition sector

      3.   Write a new bootstrap record

      4.   Install the PC–RCU application

   b.   The following is a list of the files on the Install Disk:

      PCRCU.ABS — PC–RCU system application file.

      AUTOEXEC.BAT — This file displays the installation instructions on the PC–RCU screen.

      COMMAND.COM — DOS command file.

      INSTALL.BAT — This file will perform the following procedures: 1) Copy files needed to create a bootable disk, 2) Make the Hard drive a bootable VRTX disk, and 3) Copy PC–RCU application to hard disk.

      SAVEPART.EXE — Makes a backup copy of the hard disk partition sector, named partsect.sav.

      HMKB.EXE — Writes the hard disk partition bootstrap record. Requires a partsect.sav file before proceeding.

      HARDSECT.BIN — The hard disk partition bootstrap record for VRTX.

      HARDBOOT.BIN — The VRTX loader for hard disk.

RESTORE.BAT — This batch file restores the DOS partition sector stored in partsect.sav.

Upon boot up of the PC–RCU system the configuration file DRECN.CFG (domestic) or ORECN.CFG (oceanic) and the error logger file ERRLOG.DAT will be created if they don't already exist. The system will be accessing these files during operation.

12.9.3.2   Software Installation.   For installation, insert Install Disk in floppy drive A. Power OFF and back ON the PC. At the DOS prompt, type **install** and the installation to the hard drive will be accomplished. After the necessary files are installed, the install program will write the hard disk partition bootstrap record to make the hard disk a VRTX bootable disk. This is necessary to allow the PC to boot up under VRTX and automatically load the PC–RCU application. Prior to doing this, the install program will prompt the user for verification. Enter **Y** at the prompt. This will complete the software installation. After the DOS prompt appears on the screen the installation is complete. Remove the floppy disk from drive A, power OFF the PC and power it back ON. The PC will now automatically boot up as a PC–RCU.

12.9.3.3   Peripheral Interface Boards.   The peripheral interface board can be configured as either the A-board (standard) or B-board (optional). The standard configuration is the A-board configuration allowing up to 8 peripherals. When configuration exceeds 8 peripherals, a second board (B-board) can be added to allow for up to 16 peripherals.

12.9.3.3.1   Star Gate PLUS–8 Serial Port Board.   Set switch 1 on the PLUS–8 Board as shown in figure 12–16. Figure 12–15 shows the location of the switch.

NOTE

Label the board on the outside above the connector so after installation it
will be distinguishable from the rear panel.

12.9.3.3.2   Digi International ClassicBoard 8.   The Digi International ClassicBoard 8 can be configured using software provided by Digi. The board is configured at the factory as an A-board. However, the configuration program delivered with the board should be run to verify the correct settings. Also, if a B-board configuration is desired the configuration program should be run to configure B-board. Figure 12–17 shows the proper configuration of the board(s).

To run the configuration utility, power OFF the PC. Insert the Digi International floppy disk labeled **Classic Board Utilities Disk**. Power ON PC and enter **CFG** at the DOS prompt. The configuration will be displayed for the board that is highlighted in the upper left hand corner of the screen. Ensure the board(s) are configured properly. If changes are made, write the new configuration to the board.

12.9.3.3.3   Stargate to Digi Conversion.   When replacing a Stargate PLUS–8 with the Digi Classic-Board 8 the pinout of the peripheral interface cable needs to be changed. This can be accomplished by using a conversion adapter cable that is available through the Logistics Center or by re-pinning the connector of the peripheral adapter cable. Refer to figure 12–18 for pinout of the conversion cable or figure 12–13 of the pinout of the Digi peripheral connection. Refer to paragraph 12.8.1 for NSN number of the conversion cable.

12.9.3.4   Qua Tech MPA–100 Board.   Set the switches and jumpers on the MPA–100 board as described in figures 12–19 and 12–20. The jumpers and switches not referenced in this section should be left at the factory setting as specified by the MPA–100 Hardware Reference Guide.

NOTE

Label the board on the outside above the connector so after installation it
will be distinguishable from the rear panel.

A-Board		B-Board (2 board cfg)	
Port	I/O Base IRQ	Port	I/O base IRQ
1	0280	1	0180
2	0288	2	0188
3	0290	3	0190
4	0298	4	0198
5	02A0	5	01A0
6	02A8	6	01A8
7	02B0	7	01B0
8	02B8	8	01B8

|			
PNP Mode:	No	PNP Mode:	No
Int Mode:	Star Gate	Int Mode:	Star Gate
I/O Address:	0680	I/O Address:	0580
IRQ:	4	IRQ:	5
No Waits:	0	No Waits:	0

FIGURE 12-17.   CLASSICBOARD 8 CONFIGURATION
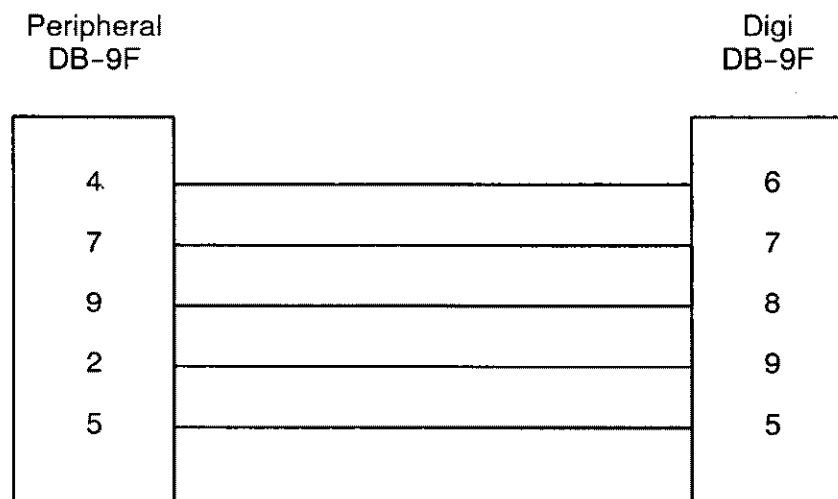
FIGURE 12-18.   STARGATE TO DIGI CONVERSION CABLE

Switch SW1	1 — on	Switch SW2	1 — on
	2 — on		2 — off
	3 — on		3 — off
	4 — on		4 — off
	5 — on		5 — on
	6 — on		6 — not used
	7 — off		
	8 — on		

FIGURE 12-19.   MPA-100 BOARD SWITCH SETTINGS

Jumper   J1   Connect 1-2

NOTE

Jumper 1 only applies to earlier revisions of the card. Disregard if jumper 1 is not present.

J2   Connect 1-2

J4   Connect 2-3

J5   Connect 2-8 (IRQ 3)

NOTE

The numbers marked next to jumper number 5 (J5) refer to the interrupt level and are not pin numbers. Connect pins 2 and 8. This will enable interrupt level 3.

J6, J7,
J8, J9   Nothing

J11   1-9, 2-10, 3-11, 4-12,
          5-13, 6-14, 7-15, 8-16

J12   1-5, 2-6, 3-7, 4-8

FIGURE 12-20.   MPA-100 BOARD JUMPER SETTINGS

Appendix A

LIST OF ACRONYMS AND ABBREVIATIONS

A	Ampere
ac	Alternating Current
ACK	Acknowledge
ADC	Analog to Digital Converter
ADCCP	Advanced Data Communication Control Procedures
AF	Airway Facilities
AT	Air Traffic
ARTCC	Air Route Traffic Control Center
ASCII	American Standard for Computer Information Interchange
ATCT	Air Traffic Control Tower
bps	Bits Per Second
BC	Bus Connector
BITE	Built-In Test Equipment
BPRN/	Bus Priority Request Input
BPRO/	Bus Priority Request Output
CCU	Central Control Unit
CD	Carrier Detect
CDA	Carrier Detect A
CDB/	Carrier Detect B
CMOS	Complimentary Metal Oxide Semiconductor
CPFS	Computer Program Functional Specification
CPU	Central Processing Unit

CRT	Cathode Ray Tube
CS	Chip Select
CTS	Clear to Send
DBTDS	Data Base Table Design Specification
DEN	Data Enable
DIAG	Diagnostic
DIP	Dual Inline Package
DM	Data Mode
DMA	Direct Memory A
DMA	Direct Memory Access
DOD	Department of Defense
DRS	Data Read Select
DRW	Data Read/Write
DSR	Data Set Ready
DVM	Digital Volt Meter
EBCDIC	Extended Binary Coded Decimal Information Code
EIA	Electronics Industry Association
EOM	End of Message
EPROM	Erasable Programmable Read-Only Memory
EEPROM	Electrically EPROM
ETX	End of Text
FAA	Federal Aviation Administration
FDEP	Flight Data Entry and Printout
FDIO	Flight Data Input/Output
FIFO	First In First Out
FS	Fail Safe
FSE	Fail-Safe Electronics
FSG	Federal Systems Group

FSP	Flight Strip Printer
GCA	Ground Controlled Approach
GFE	Government Furnished Equipment
GPI	General Purpose Input
GPO	General Purpose Output
HCS	Host Computer System
HDD	Hardware Design Data
HDLC	High-Level Data Link Control
HST	Hardware Site Test
Hz	Hertz
ICL	Intercomputer Link
IDC	Insulation Displacement Connection
IDS	Insulation Displacement Socket
IFR	Instrument Flight Rules
Int Req	Intervention Required
I/O	Input/Output
LAN	Local Area Network
LCD	Liquid Crystal Display
LSB	Least Significant Bit
LSI	Large-Scale Integration
Mb	Megabyte
MSB	Most Significant Bit
MDACK/	Multimodule Board DMA Acknowledge Signal
MDRQT	Multimodule Board DMA Request Signal
MHz	Megahertz
mm	Millimeter
MMIO	Memory Mapped I/O
MPSC	Multiple Protocol Serial Controller

MRC	Modem Receive Clock
MRDC/	Memory Read Command
MRX	Modem Receive Data
ms	milliseconds
MTC	Modem Transmit Clock
MTX	Modem Transmit Data
MWL	Message Waiting Light
MWT/	Memory Write Line
MWTC/	Memory Write Command
NAS	National Airspace System
NASSIM	NAS Simulator
ns	Nanosecond
OCPD	Overall Computer Program Description
OSC	Oscillator
OSHA	Occupational Safety and Health Administration
PA2	Port A, Bit 2
PAL	Programmable Array Logic
PAMRI	PAM Replacement Item
PC-RCU	Personal Computer-Remote Control Unit
PCB	Printed Circuit Board
PCU	Printer Control Unit
PDS	Program Design Specification
PIC	Programmable Interrupt Controller
PIT	Programmable Interval Timer
PPI	Programmable Peripheral Interface
PROM	Programmable Read Only Memory
PRXN	Peripheral Receive Data Negative
PRXP	Peripheral Receive Data Positive

PTXN	Peripheral Transmit Data Negative
RAM	Random Access Memory
RANK	Replacement Alphanumeric Keyboard
RAPCON	Radar Approach Control
RATCF	Radar Air Traffic Control Facility
RC	Receive Common
RCU	Remote Control Unit
RECN	Reconfiguration
RFSP	Replacement Flight Strip Printer
Rx	Receive
RxC	Receive Clock
RxCB	Receive Clock Channel B
SC	Send Common
SCC	Serial Communications Controller
SD	System Design
SDD	Software Design Data
SDLC	Synchronous Data Link Communication
SEL	Select
SG	Signal
SGND	Signal Ground
SICD	Software Interface Control Document
TELCO	TELephone COmpany
TRACON	Terminal Radar Control
TTL	Transistor–Transistor Logic
Tx	Transmit
TxC	Transmit Clock
TxCA	Transmit Clock Channel A
UART	Universal Asynchronous Receiver Transmitters

UF	Ultrasonic Frequency
V	Volts
V ac	Volts Alternating Current
V dc	Volts Direct Current
VGA	Video Graphics Array
VRTX	Versatile Real-Time Executive